```
S S8 AND MPEG AND TS AND PES
            932   S8
         253910   MPEG
         343594   TS
          44305   PES
S13           7   S S8 AND MPEG AND TS AND PES

?  TYPE S13/3,K/ALL
```

13/3K/1 (Item 1 from file: 348) Links
Fulltext available through: Order File History
EUROPEAN PATENTS

01515412
MPEG table structure
MPEG Tabellenstruktur
Structure de table **MPEG**
MPEG table structure
MPEG Tabellenstruktur
Structure de table **MPEG**

Patent Assignee:

- **Canal+ Technologies Societe Anonyme**; (2995881)
  34 Place Raoul Dautry; 75906 Paris Cedex 15; (FR)
  (Applicant designated States: all)

Inventor:

- **Burckard, Antoine**
  Canal+Technologies S.A. 34 Place Raoul Dautry; 75906 Paris, Cedex 15; (FR)
- **Lepine, Thierry**
  Canal+Technologies S.A.&34 Place Raoul Dautry; 75906 Paris, Cedex 15; (FR)
- **Chouteau, Philippe**
  Canal+Technologies S.A. 34 Place Raoul Dautry; 75906 Paris, Cedex 15; (FR)

Legal Representative:

- **Kohrs, Martin (88662)**
  Thomson multimedia 46, quai A. Le Gallo; 92100 Boulogne-Billancourt; (FR)

	Country	Number	Kind	Date	
Patent	EP	1267579	A2	20021218	(Basic)
	EP	1267579	A3	20030319	
Application	EP	2001306315		20010723	
Priorities	EP	2001401512		20010611	

Designated States:
AT; BE; CH; CY; DE; DK; ES; FI; FR; GB;

GR; IE; IT; LI; LU; MC; NL; PT; SE; TR;

Extended Designated States:
AL; LT; LV; MK; RO; SI;

International Patent Class (V7): H04N-007/24; H04N-007/26; H04N-007/52; H04N-005/00; H04L-029/06; H04N-007/16**Abstract** ...A2

Abstract Word Count: 65
NOTE: 8
NOTE: Figure number on first page: 8

Type	Pub. Date	Kind	Text

Publication: English
Procedural: English
Application: English

Available Text	Language	Update	Word Count
CLAIMS A	(English)	200251	2260
SPEC A	(English)	200251	17615
Total Word Count (Document A) 19875			
Total Word Count (Document B) 0			
Total Word Count (All Documents) 19875			

Specification: ...A2

The present invention relates to a generic **MPEG** table processor for processing a transport packet stream. The invention is particular suitable for a... ...additional functions, such as a web browser, a video recorder, or a television.

The term **MPEG** refers to the data transmission standards developed by the International Standards Organisation working group "Motion Pictures Expert Group" and in particular but not exclusively the **MPEG**-2 standard developed for digital television applications and set out in the documents ISO 13818... ...context of the present patent application, the term includes all variants, modifications or developments of **MPEG** formats applicable to the field of digital data transmission.

According to a first aspect of the present invention, there is provided a data structure for an **MPEG** private table section including a data portion, the data structure comprising a size specifier specifying... ...particular data block, the need to provide a different structure for each use of the **MPEG** private table section can be eliminated, since a generic data structure can be defined. Furthermore... ...compatible, since the conventional size specifier can be retained.

It will be understood that the **MPEG** standard size specifier as referred to above specifies the size of the section in terms... ...to a further aspect of the invention, there is provided a data structure for an **MPEG** private table section including a data portion, the data portion comprising a plurality of data... ...relevant to the content of the block.

A preferred embodiment of data structure for an **MPEG** private table comprises only one structure as described above.

An alternative embodiment of data structure for an **MPEG** private table comprises a plurality of structures as described above.

Hence two generic data structures... ...These two generic structures can be used dependent upon circumstances.

The structure preferably includes an **MPEG** standard header and a further header.

Preferably the further header includes a flag representative of... ...the data portion.

A further aspect of the invention provides a method of assembling an **MPEG** private table, comprising providing a data portion and adding a flag representative of a state...to a further aspect of the invention, there is provided a data structure for an **MPEG** private table section, comprising an **MPEG** standard header, a further header and a data portion.

The presence of the **MPEG** standard header can permit compatibility with existing private table sections, whilst the presence of the... ...A further aspect of the invention provides a method of performing a transformation on an **MPEG** private table, the table comprising a data portion, the method comprising compressing the data portion... ...A further aspect of the invention provides a method of performing a transformation on an **MPEG** private table, the table comprising a data portion, the method comprising decompressing the data portion... ...A further aspect of the invention provides a method of performing a transformation on an **MPEG** private table, the table comprising a data portion, the method comprising encrypting the data portion... ...A further aspect of the invention provides a method of performing a transformation on an **MPEG** private table, the table comprising a data portion, the method comprising decrypting the data portion... ...structure to be recreated.

Typically said plurality of data blocks are data portions of an **MPEG** private table.

The transformed block is typically also used to form part of a transformed **MPEG** private table.

Typically the **MPEG** private table comprises a plurality of table sections each including a standard header and a data portion, and the transformed **MPEG** private table comprises a plurality of table sections each including a standard header and a... ...provided by the transformed block.

At least a part of a header in the transformed **MPEG** private table may be substantially identical to a part of a standard header in the **MPEG** private table.

The method may further comprise including a value in the transformed **MPEG** private table specifying the type and/or state of transformation.

The method preferably comprises the... ...comprises a header associated with each decrypted data block.

Typically the header is a standard **MPEG** header.

A further aspect of the invention provides a compressed **MPEG** private table section and/or a compressed **MPEG** private table. Compression of the standard **MPEG** private tables saves storage space and bandwidth.

A further aspect of the invention provides an encrypted **MPEG** private table section and/or an encrypted **MPEG** private table.

A further aspect of the invention provides an **MPEG** private table section or **MPEG** private table comprising target information which identifies a receiver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table section.

The target information may directly identify a specific receiver/decoder or group... ...or hardware platform.

A further aspect of the invention provides a method of assembling an **MPEG** private table section, the method comprising inserting target information which identifies a receiver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table section.

A further aspect of the invention provides apparatus for assembling an **MPEG** private table, comprising means for providing a transformed data portion which has been subject to... ...transformation.

A further aspect of the invention provides apparatus for performing a transformation on an **MPEG** private table, the table comprising a data portion, the apparatus comprising means for compressing, decompressing... ...form a transformed block.

A further aspect of the invention provides apparatus for assembling an **MPEG** private table section, the apparatus comprising means for inserting target information which identifies a receiver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table section.

According to a further aspect of the invention, there is provided a parser for parsing an **MPEG** private table section including a data portion, comprising means (for example in the form of... ...content.

Preferably, the parser is adapted to parse data in a format comprising only one **MPEG** section.

Alternatively, the parser is adapted to parse data in a format comprising a plurality of **MPEG** sections.

Preferably, the parser is adapted to parse data in a format including an **MPEG** standard header and a further header.

According to a further aspect of the invention, there is provided a parser for parsing an **MPEG** private table section, comprising means (for example in the form of a processor with associated memory) for parsing data in a format comprising an **MPEG** standard header, a further header and a data portion.

Preferably, the parser is adapted to... ...in a format wherein the parser type field is the first field of the further **header**.

Preferably, the **parser** is adapted to parse data in a format wherein the further header comprises a field... ...to a further aspect of the invention, there is provided a parser for parsing an **MPEG** private table section comprising an **MPEG** standard header and a data portion, the **MPEG** standard header including a TID extension field, comprising means (for example in the form of...the receiver/decoder;

Figure 7a illustrates an interrelationship between a number of components of an **MPEG** stream;

Figure 7b shows how an application may be made up of modules/tables, which... ...1. The invention includes a mostly conventional digital television system 2 that uses the known **MPEG**-2 compression system to transmit compressed digital signals. In more detail, **MPEG**-2 compressor 3 in a broadcast centre receives a digital signal stream (typically a stream... ...to the end user's television set 14. The receiver/decoder 13 decodes the compressed **MPEG**-2 signal into a television signal for the television set 14. Although a separate receiver...broadcast centre, the digital video signal is first compressed (or bit rate reduced), using the **MPEG**-2 compressor 3. This compressed signal is then transmitted to the multiplexer and scrambler 4... ...The scrambler generates a control word used in the scrambling process and included in the **MPEG**-2 stream in the multiplexer 4. The control word is generated internally and enables the... ...the programme.

Access criteria, indicating how the programme is commercialised, are also added to the **MPEG**-2 stream. The programme may be commercialised in either one of a number of "subscription... ...encrypted EMMs and encrypted ECMs.

The receiver/decoder receives the broadcast signal and extracts the **MPEG**-2 data stream. If a programme is scrambled, the receiver/decoder 13 extracts the corresponding ECM from the **MPEG**-2 stream and passes the ECM to the "daughter" smartcard 48 of the end user... ...word extracted. The decoder 13 can then descramble the programme using this control word. The **MPEG**-2 stream is decompressed and translated into a video signal for onward transmission to television... ...14.

If the programme is not scrambled, no ECM will have been transmitted with the **MPEG**-2 stream and the receiver/decoder 13 decompresses the data and transforms the signal into...and PPV chain areas to the multiplexer and scrambler 4, and hence to feed the **MPEG** stream with EMMs. If other rights are to be granted, such as Pay Per File...not tied to a particular real-time operating system (RTOS) or to a particular processor.

MPEG Systems

Conventional digital television broadcast systems transmit data in the form of discrete transport stream... ...each packet being of a predetermined length and containing a header and a body. The **MPEG**

standard is the currently favoured standard in this domain and sets out, amongst other things...processor in the form of what is conventionally known as a packetised elementary stream or **PES**. This continuous flux of data, which is formed by assembling the bodies of the transport packets, itself comprises a sequence of packets, each **PES** packet comprising a packet header and body.

Other data not requiring immediate processing may also be encapsulated within the bodies of the transport packets. Unlike **PES** data, which is treated immediately by a processor to generate a real time output, this... ...the section or table including a table ID or TID.

Various aspects of a conventional **MPEG** datastream will now be described with reference to Figures 7a, 7b and 7c which are... ...of which is incorporated herein by reference.

Referring to Figure 7a, as is known, the **MPEG**-2 bitstream includes a programme access table ("PAT") 310 having a packet identification ("PID") of... ...programmes. Each PMT contains a reference to the PIDs of the streams of the audio **MPEG** tables 314 and video

MPEG tables 316 for that programme. A packet having a PID of zero, that is the programme access table 310, provides the entry point for all **MPEG** access.

In order to download applications and data for them, two new stream types are... ...and the relevant PMT also contains reference to the PIDs of the streams of application **MPEG** tables 318 (or sections of them) and data **MPEG** tables 320 (or sections of them).

Referring to Figure 7b, in order to download an application 322, the application is divided into modules 324 each formed by an **MPEG** table, some of which are made up by a single section 318, and others of... ...328, but different respective TID extensions.

For each application 322, there is a single such **MPEG** table 324 which is used as a directory, and which is shown in greater detail... ...application which is transmitted has a respective predetermined TID 328. To download an application, the **MPEG** table having the appropriate TID and a TID extension of zero is downloaded to the... decreasing or at least better managing the information broadcast will be investigated presently.

A private **MPEG** table section is shown below in Table 1. This format is used uniquely to put raw data into **MPEG** sections. The maximum number of sections is dependent upon the section(underscore)syntax(underscore)indicator... ...shown as a generic data structure in Figure 8.

The data structure comprises a conventional **MPEG** private table section header 400. The table(underscore)id(underscore)extension field 402 of the... ...conventional CRC information 420 is retained.

The raw data portion (or body) of the standard **MPEG** private data section is replaced by further header 404 comprising additional header fields, plus a... ...minimum.

Attributes will in the following also be referred to as descriptors in line with **MPEG** standard terminology. Lists will likewise also be referred to as loops as loop constructs will... ...Table 1, compatibility with the existing structure is maintained. This also gives compatibility with existing **MPEG** table handling hardware and software.

The private table sections will usually be generated at the... ...have been assembled in a memory at the broadcast centre, they are inserted into an **MPEG** stream and broadcast to receiver/decoders. A receiver/decoder may then retrieve the information from the **MPEG** stream and recreate the data structures in its memory before passing them to a parser...and default values. The binary data format is given using the mnemonics defined in the **MPEG** standard.

The fields between, but excluding, last(underscore)section(underscore)number and CRC(underscore)32... comprising a parser provides a layer of abstraction between the application layer 508 and the **MPEG** table reception and filtering layer 504, which extracts information sent by the broadcast system 500 ... ...are not compressed, so that the compressed table may be processed and transmitted using standard **MPEG** hard- and software, and so that the receiver may determine whether a table has been... ...which algorithm was used to compress it. Only the body (or data portion) of the **MPEG** private table is compressed. In other examples, everything between (but excluding) ...respective lengths, is then compressed to give a new, compressed, data block. A new private **MPEG** table is then created from this block by splitting it into a number of segments... ...accordingly. Apart from these flags and the fields relating to section numbers and sizes, the **MPEG** standard and further headers

otherwise remain the same as in the original table. The compressed... ...more detail with reference to Figures 11A and 11B.

Referring first to Figure 11A, private **MPEG** Table 700 comprises N private table sections 702 through to 704. Each table section comprises a standard **MPEG** private table section header A, a further header B, a body C1 to Cn, and... ...then compressed using any suitable compression algorithm. This results in compressed block 708.

A compressed **MPEG** private table 710 is then produced from compressed block 708 in the following manner. Compressed... ...may then be transmitted or stored. The compressed table is compatible not only with the **MPEG** standard private table, but also with the generic private table format as described above and... ...than individually, a higher compression ratio may be achieved.

Turning now to Figure 11B, compressed **MPEG** private table 710 is decompressed in the following manner. Section bodies C' 1 to C... ...into its original constituents, namely section bodies C1 to Cn, and the original, uncompressed private **MPEG** table 720 having table sections 722 to 724 is reconstructed from these ...to the applications, and, to a large extent if not wholly, the parser. Since the **MPEG** standard header remains unchanged in the compressed and/or encrypted table and the standard **MPEG** private table section structure is therefore retained, compression/encryption is also transparent to the lower-level **MPEG** compliant modules concerned with transmission, reception and filtering of **MPEG** tables. At the receiver/decoder, compressed and/or encrypted tables are retrieved from the incoming... ...table ID and table ID extension fields. Ease of access to compressed/encrypted information in **MPEG** streams is therefore maintained.

The compression / encryption technique has here been described in the context of the generic **MPEG** private table structure discussed previously and exemplified in Tables 2 and 3. However, it is also applicable to standard **MPEG** private tables, which may be compressed and encrypted using the same technique. In some such... ...section bodies. The technique is also applicable to other similar data structures which are not **MPEG** private tables.

Application Examples

The embodiments described above may be used in a number of... and use the data pointed to by the memorized entry(underscore)point (ON(underscore)ID, **TS**(underscore)Id, SV(underscore)ID and association(underscore)tag). The format of the downloaded data... metadata. This metadata comes from the Content Provider (in XML format) and is put into **MPEG** private sections. Those sections sent to the STB are broadcast in a carousel mode.

There... ...the tables relating to a required category of assets to be extracted easily from the **MPEG** stream through hardware filtering. The user may, for example, request to see a list of... ...retrieval of the relevant asset information.

The possible available categories are also transmitted in another **MPEG** private data table. The list of available assets constitutes a program catalogue. Further tables are...

Claims: ...A2

1. A data structure for an **MPEG** private table section including a data portion, the data structure comprising a size specifier specifying... ...including a respective one of such further size specifiers.

3. A data structure for an **MPEG** private table section including a data portion, the data portion comprising a plurality of data... ...such block includes a tag representative of its content.

13. A data structure for an **MPEG** private table, comprising only one structure as claimed in any of claims 1 to 12.

14. A data structure for an **MPEG** private table, comprising a plurality of structures as claimed in any of claims 1 to 12.

15. A data structure for an **MPEG** private table section, comprising an **MPEG** standard header, a further header and a data portion.

16. A structure according to claim... ...26. A structure according to claim 24 or 25 wherein the header is a standard **MPEG** header.

27. A compressed **MPEG** private table section.

28. A compressed **MPEG** private table, comprising at least one compressed **MPEG** private table section as claimed in claim 27.

29. A compressed **MPEG** private table.

30. An encrypted **MPEG** private table section.

31. An encrypted **MPEG** private table, comprising at least one encrypted **MPEG** private table section as claimed in claim 30.

32. An encrypted **MPEG** private table.

33. An **MPEG** private table section comprising target information which identifies a receiver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table section.

34. An **MPEG** private table, comprising at least one **MPEG** private table section as claimed in claim 33.

35. An **MPEG** private table comprising target information which identifies a receiver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table.

36. An **MPEG** private table or private table section according to any of claims 33 to 35, wherein... ...as claimed in any of claims 1 to 36.

38. A method of assembling an **MPEG** private table, comprising providing a data portion and adding a flag representative of a state... ...has been subject to a transformation.

40. A method of performing a transformation on an **MPEG** private table, the table comprising a data portion, the method ...claims 43 to 55 wherein said plurality of data blocks are data portions of an

MPEG private table.

57. A method according to any of claims 43 to 56, further comprising forming a transformed **MPEG** private table having at least one transformed data portion provided by the transformed block.

58. A method according to claim 56 and 57 wherein the **MPEG** private table comprises a plurality of table sections each including a standard header and a data portion, and the transformed **MPEG** private table comprises a plurality of table sections each including a standard header and a... ...claim 57 or 58 wherein at least a part of a header in the transformed **MPEG** private table is substantially identical to a part of a header in the **MPEG** private table.

60. A method according to claim 57,58 or 59, further comprising including a value in the transformed **MPEG** private table specifying the type of transformation.

61. A method according to any of claims 57 to 60, further comprising including a value in the transformed **MPEG** private table specifying the state of transformation of the transformed data portion.

62. A method of transmitting an **MPEG** private table, comprising performing a transformation on the **MPEG** private table using a method according to any of claims 56 to 61, and transmitting the transformed table.

63. A method of receiving an **MPEG** private table, comprising receiving the **MPEG** private table and performing a transformation on the received table using a method according to... ...group of receiver/decoders which is an intended recipient.

68. A method of assembling an **MPEG** private table section, the method comprising inserting target information which identifies a receiver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table section.

69. Apparatus for assembling an **MPEG** private table, comprising means (for instance in the form of a processor with associated memory... ...flag representative of the type of transformation.

70. Apparatus for performing a transformation on an **MPEG** private table, the table comprising a data portion, the apparatus comprising means (for instance in assembling an **MPEG** private table section, the apparatus comprising means (for instance in the form of a processor... ...a receiver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table section.

73. A parser comprising means (for example in the form of a processor with associated memory) for parsing an **MPEG** private table or table section according to any of claims 27 to 36, or for... ...method according to any of claims 36 to 68.

74. A parser for parsing an **MPEG** private table section comprising an **MPEG** standard header and a data portion, the **MPEG** standard header including a TID extension field, comprising means (for example in the form of... ...claims 1 to 26.

81. A receiver/decoder adapted to receive and/or decode an **MPEG** private table or table section according to any of claims 27 to 36, or which... ...claimed in any of claims 1 to 26.

84. A transmitter adapted to transmit an **MPEG** private table or table section according to any of claims 27 to 36, or which...

13/3K/2 (Item 2 from file: 348) Links
Fulltext available through: Order File History
EUROPEAN PATENTS

01315064
METHOD AND SYSTEM FOR DECODING VIDEO AND GRAPHICS
VERFAHREN UND SYSTEM ZUR DEKODIERUNG VON VIDEOSEQUENZEN UND GRAFIKEN
METHODE ET SYSTEME DE DECODAGE VIDEO ET GRAPHIQUE

Patent Assignee:

- **Broadcom Corporation**; (2064673)
  16215 Alton Parkway, P.O. Box 57013; Irvine, CA 92618-3616; (US)
  (Proprietor designated states: all)

Inventor:

- **MACINNIS, Alexander, G.**
  3151 Zanker Road; San Jose, CA 95134; (US)
- **TANG, Chengfuh, Jeffrey**
  16215 Alton Parkway; Irvine, CA 92618-3616; (US)
- **XIE, Xiaodong**
  16215 Alton Parkway; Irvine, CA 92618-3616; (US)
- **KRANAWETTER, Greg, A.**
  16215 Alton Parkway; Irvine, CA 92618-3616; (US)
- **HSIUN, Vivian**
  16215 Alton Parkway; Irvine, CA 92618-3616; (US)
- **CHEUNG, Francis**
  16215 Alton Parkway; Irvine, CA 92618-3616; (US)
- **BHATIA, Sandeep**
  16215 Alton Parkway; Irvine, CA 92618-3616; (US)
- **VALMIKI, Ramanujan**
  16215 Alton Parkway; Irvine, CA 92618-3616; (US)
- **KUMAR, Sathish**
  16215 Alton Parkway; Irvine, CA 92618-3616; (US)

Legal Representative:

- **Jehle, Volker Armin, Dipl.-Ing. et al (95141)**
  Patentanwalte Bosch, Graf von Stosch, Jehle, Fluggenstrasse 13; 80639 Munchen; (DE)

	Country	Number	Kind	Date	
Patent	EP	1238541	A1	20020911	(Basic)
	EP	1238541	B1	20040317	
	WO	2001045426		20010621	

Application	EP	2000986351		20001213	
	WO	2000US33757		20001213	
Priorities	US	170866	P	19991214	
	US	641374		20000818	
	US	641936		20000818	
	US	643223		20000818	
	US	640870		20000818	
	US	640869		20000818	
	US	641930		20000818	
	US	641935		20000818	
	US	642510		20000818	
	US	642458		20000818	

Designated States:
AT; BE; CH; CY; DE; DK; ES; FI; FR; GB;
GR; IE; IT; LI; LU; MC; NL; PT; SE; TR;

Extended Designated States:
AL; LT; LV; MK; RO; SI;

International Patent Class (V7): H04N-009/64; G09G-001/16
NOTE: No A-document published by EPO

Type	Pub. Date	Kind	Text

Publication: English
Procedural: English
Application: English

Available Text	Language	Update	Word Count
CLAIMS B	(English)	200412	1752
CLAIMS B	(German)	200412	1658
CLAIMS B	(French)	200412	2019
SPEC B	(English)	200412	67354
Total Word Count (Document A) 0			
Total Word Count (Document B) 72783			
Total Word Count (All Documents) 72783			

Specification: ...embodiment of the present invention;

FIG. 41 is a block.diagram that illustrates distribution of **MPEG** Transport streams in one embodiment of present invention;

FIG. 42 is a block diagram of... ...SDTV video output while displaying an HDTV video;

FIG. 49 is a block diagram of **MPEG** video decoding stages in one embodiment;

FIG. 50 is a block diagram of **MPEG** video decoding stages in another embodiment;

FIG. 51 is a process diagram illustrating frame-prediction... ...conventional type of analog signal. The digital signals may be in the form of decoded **MPEG** signals or other format of digital video. In an alternate embodiment, the system includes an on-chip decoder for

decoding the **MPEG** or other digital video signals input to the system. Graphics data for display is produced... ...content, including anti-aliased text and graphics, patterns, GIF images, JPEG images, live video from **MPEG** or analog video, three dimensional graphics, cursors or pointers, control panels, menus, tickers, or any... ...mixing of the locally created audio with audio from a digital audio source, such as **MPEG** or Dolby, and with digitized analog audio. The audio engine also preferably supports applications that... ...one or more of a wide variety of peripheral devices, such as flash memory, ROM, **MPEG** decoders, cable modems or other devices. The on-chip I/O bus 74 of the...time.

In the preferred embodiment, the system may receive video input that includes one decoded **MPEG** video in ITU-R 656 format and one analog video signal. The ITU-R 656 decoder 160 processes the decoded **MPEG** video to extract timing and data information.

In one embodiment, an on-chip video decoder... ...and provides the digitized video to the system as bypass video 130.

Analog video or **MPEG** video may be provided to the video compositor as passthrough video. Alternatively, either type of... ...FIFO 158 and a capture DMA 154 preferably capture the digitized analog video signals and **MPEG** video. The SDRAM controller 126 provides captured video frames to the external SDRAM. A video... ...to a video FIFO 148 from the external SDRAM.

The digitized analog video signals and **MPEG** video are preferably scaled down to less than 100% prior to being captured and are...YUV. Alternatively they can be in RGB or other formats.

When digital video, e.g., **MPEG** is provided to the graphics display system or when analog video is digitized, the digital...invention. The integrated circuit 1400 may include inputs 1412 for receiving three transport channels of **MPEG**-2 Transport 1410, an analog input 1416 for receiving an analog video 1414, an output... ...signals or any other conventional type of analog signal. The digital video signals may include **MPEG**-2 video. The system may accept multiple channels of **MPEG**-2 video. For example, the **MPEG** -2 Transport streams containing **MPEG**-2 video may include three channels, two in-band channels and one out-of-band channel. The **MPEG**-2 Transport streams may also contain audio and data information. The system may also be capable of decoding and displaying **MPEG**-1 video.

The two in-band channels may be used for applications such as, for... ...channel may carry private data, which is any data that is not specified by the **MPEG** standard. The private data may include program guides.

The **MPEG**-2 Transport streams (**TS**) may be provided over a cable, a satellite system or any combination of available media for transmitting **MPEG**-2 video, audio and data. The **MPEG**-2 Transport streams may include a DOCSIS (Data over Cable Services Interface Specification) component that... ...both of the two in-band channels may carry a signal that is interleaved between **MPEG**-2 video and DOCSIS data. The DOCSIS data may include, for example, digital television data... ...comprised of an analog video decoder 1500, a video scaler 1502, an HD/Dual SD **MPEG**-2 video decoder 1504, an **MPEG**-2 Transport processor with DVB and DES descramblers 1506, a bus bridge 1508, an SDRAM... ...with functions including HD display, format conversion and scaling, a graphics accelerator 1518, a Dolby & **MPEG** audio decoder 1520, a composite video encoder and HD ADCs 1522, a PCM audio 1524... ...Dac5/8s 1526.

The system preferably receives analog video through an analog video input 1528, **MPEG** Transport streams through an **MPEG** Transport input 1530, and I2)S audio through an I2)S audio input 1546. The... ...display simultaneously with decoded analog video.

The video scaler 1502 preferably downscales and upscales decoded **MPEG**-2 video and digitized analog video as needed. The scale factors may be adjusted continuously... ...one to a scale factor of four or more. With both digitized analog and decoded **MPEG**-2 video input, either one may be scaled while the other is displayed full size at the same time.

The HD/Dual SD **MPEG**-2 video decoder 1504 preferably decodes all **MPEG**-2 video streams that are compatible with Main Profile at Main Level (MP@ML), Main... ...video streams, as well as all standard digital cableand satellite streams. The HD/Dual SD **MPEG**-2 video decoder 1504 may also decode **MPEG**-2 video streams that are compatible with other profiles such as main profile at High... ...2:2@HL) and High Profile at High Level (HP@HL).

The HD/Dual SD **MPEG**-2 video decoder 1504 preferably is capable of decoding one video stream when decoding **MPEG**-2 HDTV video stream and multiple video streams as tiled video and/or PIP video... ...as tiled video and one video stream as a PIP video. The HD/Dual SD **MPEG**-2 video decoder may also perform reduced-memory decoding of **MPEG**-2 HDTV video streams for substantial savings in both memory size and memory bandwidth while retaining very high quality in both SDTV and HDTV display formats.

The **MPEG**-2 Transport processor with descramblers 1506 preferably is used for **MPEG** Transport processing including PID filtering, PSI section filtering, clock recovery and packetized elementary stream (**PES**) parsing. The **MPEG**-2 Transport processor with descramblers 1506 preferably also performs Digital Video Broadcasting (DVB) and Data Encryption Standard (DES) descrambling. The **MPEG**-2 Transport processor with descramblers may also perform descrambling of transport streams encrypted using other encryption methods. The **MPEG**-2 Transport processor with descramblers 1506 may also include one or more ISO7816 smart card or other interfaces for e-commerce and conditional access system use.

The **MPEG**-2 Transport processor with descramblers 1506 preferably performs processing of video and audio streams, **MPEG** system layer functions, and data section filtering and buffering for both standard and private section formats. The **MPEG**-2 Transport processor with descramblers 1506 preferably performs processing of multiple data PID's (packet... ...audio PID, and a program clock reference (PCR) PID. In one embodiment, for example, the **MPEG**-2 Transport processor and descramblers 1506 supports 32 data PID's, 32 section filters and... ...in 64-bit wide SDRAM, and is used to perform all of the functions including **MPEG** video decoding, graphics display, and CPU code and data storage.

This UMA design preferably facilitates... ...to utilize this memory at the same time that the memory is being used for **MPEG** decoding and graphics display. In other embodiments, the unified memory may support only a subset... ...with custom instructions and a co-processor that performs vector graphic component functions.

The Dolby & **MPEG** audio decoder preferably decodes both **MPEG** audio and Dolby Digital audio streams. The Dolby & **MPEG** audio decoder preferably decodes Dolby 5.1 channel streams and performs the Dolby specified two channel mixdown with optional Pro-logic encoding. In **MPEG** audio mode, the digital audio decoder preferably decodes two channels

in either **MPEG** Layer 1 or Layer 2. The digital audio decoder may output both analog stereo audio... ...either compressed or uncompressed PCM format. The audio engine preferably also mixes decoded Dolby or **MPEG** audio with PCM audio.

The composite video encoder and HD DACs 1522 preferably generates video... ...1646, a PCM audio 1650, an audio DAC 1652, and a video encoder (VEC) 1654.

MPEG-2 Transport and decoding in the described embodiment preferably is performed by the data transport... ...an external memory, e.g., SDRAM. The video transport 1602 preferably extracts bit stream for **MPEG**-2 video. The audio decode processor (ADP) 1614 preferably has a transport function dedicated to extracting audio bit streams.

In-band **MPEG** Transport streams IB 1 (in-band 1)and IB 2 (in-band 2) are provided to the data transport 1600 and the video transport 1602. An out-of-band **MPEG** Transport stream OOB preferably is provided to the data transport 1600, and it may also... ...to the video transport 1602.

Thus, the data transport 1600 preferably receives three channels of **MPEG** Transport streams. The data transport 1600 preferably performs PID and section filtering of the transport... ...transport 1602 and the ADP 1614.

The video transport 1602 preferably receives two in-band **MPEG** Transport streams and one out-of-band **MPEG** Transport stream. The video transport 1602 preferably extracts compressed **MPEG** video data by removing transport stream (**TS**) headers and packetized elementary stream (**PES**) headers from the input transport streams. Then the video transport 1602 preferably provides the compressed **MPEG** video data for processing in the video RISC 1604.

In other embodiments, the data transport... ...DIRECTV, Inc.

The video RISC 1604 and the row RISCs 1606, 1608 make up an **MPEG** video decoder. The **MPEG** video decoder preferably decodes the compressed **MPEG** video data and provides it to the memory controller 1634 to be stored temporarily in an external memory, e.g., SDRAM. Complex video decode process of

MPEG video preferably is partitioned into concurrently operable multiple decode functionality. The **MPEG** video decoder preferably decodes multiple rows of the compressed **MPEG** video data concurrently.

The video RISC 1604 preferably parses and processes layers of compressed **MPEG** video data above the SLICE layer, i.e., SEQUENCE, group of pictures (GOP), EXTENSION and... ...embodiment are RISC processors. Other types of processors may be used in other embodiments.

The **MPEG** video decoder may scale frames by half when saving them to frame buffers. Thus, savings... ...lengths optimized for each task, and through careful optimization of the memory access patterns for **MPEG** video decoding.

The analog video decoder (VDEC) 1636 preferably digitizes and processes analog input video... ...the external memory, e.g., SDRAM, as illustrated in a graphics read block 1622. Decoded **MPEG**-2 video preferably is provided to the video-graphics display and scale engine 1638 as indicated in **MPEG** display feeder blocks 1 and 2 1628, 1630. The video-graphics display and scale engine... ...video-graphics display and scale engine 1638

preferably also performs both downscaling and upscaling of **MPEG** video and analog video as needed. The scale factors may be adjusted continuously from a... ...less than one to a scale factor of four or more. With both analog and **MPEG** video input, either one may be scaled while the other is displayed full size at... ...DMA 1644 and the CPU interface block 1646.

The PCM audio 1650 preferably receives decoded **MPEG** or Dolby AC-3 audio from the ADP 1614. The PCM audio 1650 preferably also... ...of the locally created audio with audio from a digital audio source, such as the **MPEG** audio or Dolby AC-3, and with digitized analog audio.

The PCM audio 1650 preferably... ...serial output format.

The audio DAC 1652 provides the decoded and digital-to-analog converted **MPEG** and Dolby AC-3 audio component as an analog audio output 1674 of the system... ...one embodiment of the present invention. The data transport 1600 preferably performs descrambling of the **MPEG** Transport streams. The descrambling may include DES and DVB descrambling as well as descrambling of transport streams encrypted using other encryption methods. The data transport 1600 preferably provides the descrambled **MPEG** Transport streams to a video transport, such as the video transport 1602 of FIG. 41... ...may be configured as 32, 64 or other suitable number of circular memory buffers.

An **MPEG** Transport stream typically includes fixed-length transport packets. Each transport packet is typically 188 bytes long. The data transport 1600 preferably is an **MPEG**-2 Transport stream message/**PES** parser and demultiplexer. The data transport 1600 preferably is capable of simultaneously receiving and processing... ...transport 1600 preferably performs filtering of multiple, e.g., 32, PID's for message or **PES** processing. In other embodiments, data transport 1600 may filter more or less than 32 PID... ...In addition, the data transport 1600 preferably includes 32 PSI section filters for processing of **MPEG** or DVB sections. In other embodiments, the data transport may filter more or less than... ...program specific information (PSI) and/or private sections.

The data transport 1600 typically receives the **MPEG** Transport streams at different data rates. For example, the out-of-band transport stream is ... ...by three input synchronizers 1702a-c.

The three input synchronizers 1702a-c preferably synchronize incoming **MPEG**-2 Transport packets to the data transport clock. In other embodiments, the data transport 1600...1710. The input buffer 1710 preferably is capable of storing up to eight 188-byte **MPEG**-2 Transport packets. In other embodiments, the number of transport packets stored in the input... ...buffer 1734. The data transport and the video transport are capable of processing the incoming **MPEG**-2 Transport streams to display multiple video simultaneously in, e.g., picture-in-picture (PIP... ...1728 may extract PCRs from transport streams having different formats including but not limited to **MPEG** Transport streams and DIRECTV transport streams. The PCR output 1736 preferably is a serial output... ...1736 may be a parallel output signal.

The program clock information (PCRs) extracted from the **MPEG** Transport stream preferably is loaded into a counter and may be used to lock the... ...PCR output.

The descrambler 1712 preferably also provides the decrypted parsed transport streams to a **PES** parser 1718. The **PES** parser 1718 preferably parses the decrypted parsed transport streams and provides the **PES** header and data to the DMA controller 1724 for storage in the external memory, e.g., the circular memory buffers implemented in SDRAM. In another

embodiment, the output of the **PES** parser 1718 is not stored in the external memory. Instead, the output of the **PES** parser 1718 provides audio and video streams to the video transport 1602 and the ADP... ...1 channel or the in-band 2 channel, respectively, of the video transport 1602.

The **PES** parser may perform **PES** packet extraction for any of the PID channels. In other embodiments, there may be more... ...for all three input transport streams, spanning across all three channels. The packetized elementary stream (**PES**) parser 1718 preferably looks at the **PES** header to determine the length of the **PES** stream, and thereby figure out the end of the **PES** stream.

The descrambler 1712 preferably also provides the decrypted parsed transport streams to a PSI... ...distributed between message data from the PSI filter 1720 and video/audio data from the **PES** parser 1718. For example, 64 circular memory buffers in one embodiment may be configured into all **PES** data memory buffers. For another example, 64 circular memory buffers may be apportioned between the **PES** data and the PSI data- 62 **PES** data buffers and 2 PSI data buffers or any other distribution between the **PES** data buffers and the PSI data buffers. In addition, the data transport 1600 preferably performs... ...or less than 64 PID's.

The playback circuit (PVR) 1726 may operate in either **MPEG** mode or DIRECTV mode. The PVR 1726 preferably performs DMA function of transferring data from... ...buffers.

During the play back mode, the PVR 1726 may playback the packetized elementary streams (**PES**) extracted by the **PES** parser 1718 and stored in the external memory, i.e., circular memory buffer, rather than the transport packets. In this case, the **PES** may not be parsed in the parsers 1706a-c. The **PES** stream preferably is provided to the high speed interface module 1730 to be outputted as... ...Video Transport Processor

Referring back to FIG. 40, the video transport 1602, preferably is an **MPEG**-2 video transport. The video transport 1602 preferably has capabilities to extract video elementary streams from **PES** or transport streams, detect and handle errors at the transport/**PES** level of the video streams, segment video into rows and creates a start code table... ...the following features: a capability for receiving two in-band and one out-of-band **MPEG**-2 Transport streams; a host feed interface for feeding a transport stream; a content addressable... ...invention, the video transport 1602 is capable of receiving either a transport stream or a **PES** stream from the data transport 1600 as either in-band 1 or in-band 2... ...In other embodiments, the video transport 1602 may receive either a transport stream or a **PES** stream, but not both, from the data transport 1600. In another embodiment, the source in... ...in size. In other embodiments, the incoming stream may be stored in other formats.

The **MPEG** video decoder in one embodiment includes row decoders (row RISCs) that decode the video elementary... ...start code table, and provides the video data to the row RISCs 1606, 1608.

XVI. **MPEG** Video Decoder for Concurrent Multi-Row Decoding

The system of the present invention preferably is capable of decoding **MPEG** Main Profile at High Level (MP@HL) and ATSC-specified HDTV video streams (up to and including 1080i. The system may also decode **MPEG** streams that are compatible with other profiles such as main profile at High-1440 Level... ...allows two or more decode paths to be operated concurrently.

Referring back to FIG. 40, **MPEG** video decoding function in one embodiment is performed by three RISC processors: a video RISC 1604 for processing higher layers of **MPEG** video and row RISCs 1606 and 1608. In other embodiments, types of processors other than RISC processors and/or different number of processors may be used.

FIG. 45 illustrates **MPEG**-2 video decoding in one embodiment of the present invention. Multiple rows are concurrently decoded... ...SRAMs, which are preferably loaded from main memory automatically upon initialization of the system. The **MPEG** video decoding function is preferably performed by a video RISC 1604 and first and second... ...is optimized for its task, thereby significantly improving efficiency and/or size of implementation.

In **MPEG**-2 video elementary streams, each picture is encoded using multiple slices, where a slice is... ...includes macroblocks from more than one macroblock row.

The video RISC 1604 preferably receives compressed **MPEG** video data. The video RISC 1604 preferably parses and processes higher level layers of compressed **MPEG** video data including SEQUENCE, group of pictures (GOP), EXTENSION and PICTURE layers. The SLICEs preferably...behind the other, the block layer hardware would be forced to remain idle during the **header parsing** period, thus wasting precious MIPs and leading to under-performance.

In one embodiment of the... ...the use of two major classifications of prediction mode, frame prediction and field prediction, in **MPEG**-2.

In addition to the two major classifications of prediction mode, **MPEG**-2 uses two major classifications of the picture structure: frame picture and field picture. Thus... ...use of vertical downscaling typically would not result in a significant loss of quality. However,

MPEG-2 standard supports interlaced video with a variety of coding modes, such that the alternate (even and odd) sets of lines within a macroblock in **MPEG**-2 may represent different field time in the video stream, and both even and odd... ...distinguishes between the two fields may be lost.

FIG. 49 is a block diagram of **MPEG** video decoding stages 2100 in one embodiment of the present invention. In this embodiment, downscaling of images is not performed.

FIG. 50 is a block diagram of **MPEG** video decoding stages 2102 in another embodiment of the present invention. The **MPEG** video decoding stages in FIG. 50 preferably operate in reduced memory mode (RMM) with two... ...goals of reducing required memory bandwidth and reducing required memory space. In addition to the **MPEG** video decoding stages in FIG. 49, horizontal downscaling is performed in a downscale filtering stage... ...disabled when the coded video does not contain B pictures. In the common practice of **MPEG** video decoding, particularly when following the ATSC (Advanced Television Systems Committee) recommendations, when there are... ...savings in memory space, and no savings in memory bandwidth with worst case streams.

XIX. **MPEG** Specific Data Transfer Commands

Reading SDRAM for **MPEG** video decoding can be very inefficient, and efficiency in this operation typically is very important... ...schemes, such as "read N bytes starting at address A." This typically is inefficient for **MPEG** video decoding.

In one embodiment of the present invention, the **MPEG** video decoder preferably indicates to the memory controller exactly what type of addressing pattern is needed to return the data that is requested by the **MPEG** video decoder, using a special protocol that preferably is optimized for this purpose. The memory... ...in terms of efficiency and performance, to read from the memory and return to the **MPEG** video decoder exactly the data that were requested while preferably using the minimum possible number... ...also preferably minimizing the number of clock cycles used on the bus that couples the **MPEG** video decoder to the memory controller.

In one embodiment of the present invention, video data... ...horizontal image size, in macroblock units, is utilized to intelligently locate vertically neighboring macroblock pairs.

MPEG Smart SDRAM Control Sequencer

Memory controllers for controlling SDRAM typically are quite simplistic in nature... ...Column Address Select (CAS) operation preferably accesses a particular column within the row.

For an **MPEG** decode application, especially at HD resolution, more efficient organization of video data enhances accessibility and... ...the described embodiment, a complex memory controller with capability to access data as suitable for **MPEG** decode operation is used.

The memory controller in the described embodiment has an "**MPEG** Smart" implementation, with 128 different types of read and write burst accesses. In other embodiments... ...in different modes of operation, and different peculiar starting addresses for accesses.

Bus Interface with **MPEG** Specific Commands

For display purposes, pixels preferably are stored and read in raster scan order...2272, an audio FIFO 2270, an audio interface module 2274 and an AC-3 and **MPEG** audio decompression processor 2276.

The ADP 1614 receives a transport stream containing audio data. In... ...and processes it. The audio transport processor 2272 is responsible for processing the transport header, **PES** header and data for the audio packets. The audio transport processor 2272 also handles splicing ... ...module 2274 contains a state machine that synchronizes audio delivery to the AC-3 and **MPEG** audio decompression processor 2276 or an external audio processor using PTS and PCR.

The audio... ...parallel to serial format and delivers the serialized audio data to the AC-3 and **MPEG** audio decompression processor 2276, which is also called.

The AC-3 and **MPEG** audio decompression processor 2276 provides a decoded audio 2278. The audio processor 2276 is capable of decoding Dolby AC-3 (audio code number 3) and **MPEG** bit streams. The audio processor 2276 receives serialized compressed frequency domain samples and control information... ...inputs preferably are mixed down to two-output channels compatible with Dolby Surround equipment. For **MPEG**-1 and **MPEG**-2 audio decoding, the audio processor 2278 preferably decodes only layer 1 and layer 2... ...is concurrently used by various different devices such as CPU, the display engine, and the **MPEG** decoder. The memory 2510 may be implemented in a synchronous dynamic random access memory (SDRAM... image contents, such as anti-aliased text, patterns, GIF images, JPEG images, live video from **MPEG** or analog video, 3D graphics, backgrounds, pointers, control panels, etc., all of which may be...

Claims: ...data includes displayable video.

5. The system of claim 1 wherein the video data includes **MPEG**-2 video data, the digital video decoder (1604, 1902A, 1902B) is used to decode the **MPEG**-2 video data, the **MPEG**-2 video data is reconstructed to generate a plurality of pictures, and one or more... ...video and graphics in an integrated circuit of claim 13 wherein the video data includes **MPEG**-2 video data, and the step of processing the video data comprises the step of decoding (1604, 1902A, 1902B) the **MPEG**-2 video data to generate a plurality of pictures,

wherein one or more of the...

Claims: ...die decodierten Videodaten anzeigbares Video beinhalten.

5. Das System nach Anspruch 1, wobei die Videodaten **MPEG**-2-Videodaten umfassen, der digitale Videodecoder (1604, 1902A, 1902B) zum Decodieren der **MPEG**-2-Videodaten verwendet wird, die **MPEG** -2-Videodaten rekonstruiert werden, um eine Mehrzahl von Bildern zu erzeugen, und eines oder mehrere... ...Verarbeiten von Video und Graphiken in einer integrierten Schattung nach Anspruch 13, wobei die Videodaten **MPEG**-2-Videodaten aufweisen und der Schritt der Verarbeitung der Videodaten den Schritt der Decodierung (1604, 1902A, 1902B) der **MPEG**-2-Videodaten aufweist, um eine Mehrzahl von Bildern zu erzeugen,

wobei eines oder mehrere der...

Claims: ...5. Systeme selon la revendication 1 dans lequel les donnees video comprennent les donnees video **MPEG**-2, le decodeur video numerique 1604, 1902A, 1902B est utilise pour decoder les donnees video **MPEG**-2, les donnees video **MPEG**-2 sont reconstruites pour generer une pluralite d'images, et une ou plusieurs de la... ...circuit integre selon la revendication 13, dans lequel les donnees video comprennent des donnees video **MPEG**-2, et l'etape de traitement des donnees video comprend l'etape de decodage 1604, 1902A, 1902B des donnees video **MPEG**-2 pour generer une pluralite d'images, dans lequel une ou plusieurs de la pluralite...

13/3K/3 (Item 3 from file: 348) Links
Fulltext available through: Order File History
EUROPEAN PATENTS

01300605
Seamless splicing of encoded MPEG video and audio
Nahtlose Verbindung von **MPEG**-Video - und Audiosequenzen
Raccordement continu de sequences video et audio **MPEG**
Seamless splicing of encoded **MPEG** video and audio
Nahtlose Verbindung von **MPEG**-Video - und Audiosequenzen
Raccordement continu de sequences video et audio **MPEG**

Patent Assignee:

- **EMC CORPORATION**; (2298040)
  35 Parkwood Drive; Hopkinton, MA 01748; (US)
  (Applicant designated States: all)

Inventor:

- **Duso, Wayne W.**
  6 Timari Drive; Shrewsbury, Massachusetts 01545; (US)
- **Oguz, Seyfullah H.**
  1630 Worchester Rd., Apt.402C; Framingham, Massachusetts 01702; (US)
- **Forecast, John**
  11 Charlotte Road; Newton, Massachusetts 02459; (US)
- **Bixby, Peter**
  41 Lackey Street; Westborough, Massachusetts 01581; (US)
- **Faibish, Sorin**
  11 Selwyn Rd.; Newton, Massachusetts 02461; (US)
- **Gardere, Daniel**
  8 rue Paul Valery; 78180 Montigny-Le-Bretonneux; (FR)
- **Keller, Sebastian**
  102 rue Balard; 75015 Paris; (FR)
- **Noury, Michael**
  44 rue des Casseaux; 91140 Villebon sur Yvette; (FR)
- **Rochette, Jean-Louis**
  80 Quai Boissy d'Anglas; 78380 Bougival; (FR)

Legal Representative:

- **Waxweiler, Jean et al (19257)**
  Dennemeyer & Associates S.A., P.O. Box 1502; 1015 Luxembourg; (LU)

	Country	Number	Kind	Date	
Patent	EP	1115252	A2	20010711	(Basic)
Application	EP	2000204717		20001222	

Priorities	US	174360		20000104	
	US	540347		20000331	

Designated States:
AT; BE; CH; CY; DE; DK; ES; FI; FR; GB;
GR; IE; IT; LI; LU; MC; NL; PT; SE; TR;

Extended Designated States:
AL; LT; LV; MK; RO; SI;

International Patent Class (V7): H04N-007/24**Abstract** ...A2

Abstract Word Count: 202
NOTE: 19
NOTE: Figure number on first page: 19

Type	Pub. Date	Kind	Text

Publication: English
Procedural: English
Application: English

Available Text	Language	Update	Word Count
CLAIMS A	(English)	200128	3340
SPEC A	(English)	200128	19445
Total Word Count (Document A) 22785			
Total Word Count (Document B) 0			
Total Word Count (All Documents) 22785			

Specification: ...requirements for storage and transmission. One of the most popular audio/video compression techniques is **MPEG**. **MPEG** is an acronym for the Moving Picture Experts Group, which was set up by the International Standards Organization (ISO) to work on compression. **MPEG** provides a number of different variations (**MPEG**-1, **MPEG**-2, etc.) to suit different bandwidth and quality constraints. **MPEG**-2, for example, is especially suited to the storage and transmission of broadcast quality television programs.

For the video data, **MPEG** provides a high degree of compression (up to 200:1) by encoding 8 x 8... ...encode most video frames as predictions from or between other frames. In particular, the encoded **MPEG** video stream is comprised of a series of groups of pictures (GOPs), and each GOP... ...before the B frame.

In addition to the motion compensation techniques for video compression, the **MPEG** standard provides a generic framework for combining one or more elementary streams of digital video and audio, as well as system data, into single or multiple program transport streams (**TS**) which are suitable for storage or transmission. The system data includes information about synchronization, random... ...to enable synchronized decoding from the audio and video decoding buffers under various conditions.

The **MPEG** 2 standard is documented in ISO/IEC International Standard (IS) 13818-1, "Information Technology-Generic... ...Moving Pictures and Associated Audio Information: Audio," incorporated herein by reference. A concise introduction to **MPEG** is given in "A guide to **MPEG** Fundamentals and Protocol Analysis (Including DVB and ATSC),"

Tektronix Inc., 1997, incorporated herein by reference ... ...be done for commercial insertion, studio routing, camera switching, and program editing. The splicing of **MPEG** encoded audio/visual streams, however, is considerably more difficult than splicing of the uncompressed audio... ...splicing may cause underflow or overflow of the video decoder buffer.

The problems of splicing **MPEG** encoded audio/visual streams are addressed to some extent in Appendix K, entitled "Splicing Transport Streams," to the **MPEG**-2 standard ISO/IEC 13818-1 1996. Appendix K recognizes that a splice can be... ...overflow.

The Society of Motion Picture and Television Engineers (SMPTE) apparently thought that the ISO **MPEG**-2 standard was inadequate with respect to splicing. They promulgated their own SMPTE Standard 312M, entitled "Splice Points for **MPEG**-2 Transport Streams," incorporated herein by reference. The SMPTE standard defines constraints on the encoding of and syntax for **MPEG**-2 transport streams such that they may be spliced without modifying the packetized elementary stream (**PES**) packet payload. The SMPTE standard includes some constraints applicable to both seamless and non-seamless ... ...allowed back before the In Point).

As further discussed in Norm Hurst and Katie Comog, "**MPEG** Splicing: A New Standard for Television - SMPTE 312M," SMPTE Journal, Nov. 1998, there are two...switch for splicing broadcast audio/visual streams;

FIG. 4 is a block diagram of an **MPEG** decoder;

FIG. 5 is a diagram of the format of an **MPEG** transport packet stream;

FIG. 6 is a diagram of the format of an **MPEG** PIES packet;

FIG. 7 is a diagram showing audio and video content in two **MPEG** transport streams to be spliced,

FIG. 8 is a diagram showing aligned elementary video and audio streams resulting from the splicing of the two **MPEG** transport streams in FIG. 7;

FIG. 9 is a diagram showing that audio access units are not aligned on audio **PES** packet boundaries;

FIG. 10 is a logic table showing eight cases for the selection of audio presentation units to be included in the splicing of two **MPEG** transport streams;

FIG. 11A is a diagram showing content of video and audio presentation unit streams for the two **MPEG** transport streams for a first case in the logic table of FIG. 10;

FIG. 11B... ...video and audio presentation unit streams resulting from a first possible splicing of the two **MPEG** transport streams shown in FIG. 11A;

FIG. 11C is a diagram showing the content of video and audio presentation unit streams resulting from a second possible splicing of the two **MPEG** transport streams shown in FIG. 11A;

FIG. 12A is a diagram showing content of video and audio presentation unit streams for the two **MPEG** transport streams for a second case in the logic table of FIG. 10;

FIG. 12B... ...the content of video and audio presentation unit streams resulting from splicing of the two **MPEG** transport streams shown in FIG. 12A;

FIG. 13A is a diagram showing content of video and audio presentation unit streams for the two **MPEG** transport streams for a third case in the logic table of FIG. 10;

FIG. 13B... ...the content of video and audio presentation unit streams resulting from splicing of the two **MPEG** transport streams shown in FIG. 13A;

FIG. 14A is a diagram showing content of video and audio presentation unit streams for the two **MPEG** transport streams for a fourth case in the logic table of FIG. 10;

FIG. 14B... ...the content of video and audio presentation unit streams resulting from splicing of the two **MPEG** transport streams shown in FIG. 14A;

FIG. 15A is a diagram showing content of video and audio presentation unit streams for the two **MPEG** transport streams for a fifth case in the logic table of FIG. 10;

FIG, 15B... ...the content of video and audio presentation unit streams resulting from splicing of the two **MPEG** transport streams shown in FIG. 15A;

FIG. 16A is a diagram showing content of video and audio presentation unit streams for the two **MPEG** transport streams for a sixth case in the logic table of FIG. 10;

FIG. 16B... ...the content of video and audio presentation unit streams resulting from splicing of the two **MPEG** transport streams shown in FIG. 16A;

FIG. 17A is a diagram showing content of video and audio presentation unit streams for the two **MPEG** transport streams for a seventh case in the logic table of FIG. 10;

FIG. 17B... ...video and audio presentation unit streams resulting from a first possible splicing of the two **MPEG** transport streams shown in FIG. 17A;

FIG. 17C is a diagram showing the content of video and audio presentation unit streams resulting from a second possible splicing of the two **MPEG** transport streams shown in FIG. 17A;

FIG. 18A is a diagram showing content of video and audio presentation unit streams for the two **MPEG** transport streams for an eighth case in the logic table of FIG. 10;

FIG. 18B from splicing of the two **MPEG** transport streams shown in FIG. 18A;

FIG. 19 is a flow chart of a procedure for splicing **MPEG** clips;

FIG. 20A is a graph of video buffer level versus time for decoding the end of a first **MPEG** clip;

FIG. 20B is a graph of video buffer level versus time for decoding the beginning of a second **MPEG** clip;

FIG. 21 is a graph of video buffer level versus time for decoding of a seamless splicing of the first **MPEG** clip to the second **MPEG** clip;

FIG. 22 is a flow chart of a basic procedure for seamless splicing of ... ...video frame;

FIG. 43 is a diagram showing non-obsolete audio packets in a first **TS** Stream following the end of video at an Out Point and null packets and obsolete audio packets in a second **TS** stream following the beginning of video at an In Point;

FIG. 44 is a flow... ...with the non-obsolete audio packets in FIG. 43;

FIG. 45 is a diagram showing **MPEG** Transport Stream (**TS**) metadata computation and storage of the metadata in the header of an **MPEG TS** data file;

FIG. 46 is a block diagram of the preferred format of a GOP... ...48 is a flow chart showing metadata computations for a next GOP in an ingested **TS**;

FIG. 49 is a block diagram of various blocks in the stream server computer of the video file server of FIG. 1 for computing **MPEG** metadata during ingestion of an **MPEG TS**, and for performing real-time **MPEG** processing such as seamless splicing in real-time during real-time transmission of a spliced **MPEG TS**;

FIG. 50 is a diagram showing flow of control during a metered file transfer using... ...a flow chart showing the use of seamless splicing for repair of a temporarily corrupted **TS**.

While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof have...47 stores video clips in a compressed format. Each clip, for example, is a recorded **MPEG** transport stream, including a video elementary stream and one or more audio elementary streams synchronized... ...detect.

With reference to FIG. 2, there is shown another application for seamless splicing of **MPEG** transport streams. In this application, a set-top decoder box 61 receives a number of **MPEG** transport streams from a coaxial cable 62. Each of the **MPEG** transport streams encodes audio and video information for a respective television channel. A viewer (not... ...of the channels for viewing on a television 64. The decoder box 61 selects the **MPEG** transport stream for the desired channel and decodes the transport stream to provide a conventional... ...available from the decoder 61. If a simple demultiplexer is used to switch from one **MPEG** transport stream to another from the cable 62, a considerable time will be required for... ...audio, and freeze the video for a certain amount of time after switching from one **MPEG** transport stream to another However, this approach will slow down the maximum rate at which... ...while looking for an interesting program to watch.

A preferred solution is to incorporate an **MPEG** transport Stream splicer into the set-top decoder box. The **MPEG** splicer would be programmed to perform a seamless splicing procedure as will be described further below with reference to FIG. 7 et seq. The **MPEG** splicer would seamlessly splice from an **MPEG**

transport stream currently viewed to a selected new **MPEG** transport stream to produce an encoded **MPEG** transport stream that would be decoded in the conventional fashion without significant audio/visual discontinuities and without a significant delay. The **MPEG** splicer in the set-top decoder box would be similar to the **MPEG** splicer shown in FIG. 3.

FIG. 3 shows a switch 70 for seamless switching between **MPEG** transport streams in a broadcast environment. The switch 70 receives **MPEG** transport streams from a variety of sources, such as a satellite dish receiver 71, servers 72, 73, 74, and a studio video camera 75 and an **MPEG** encoder 76. A conventional method of seamless switching between **MPEG** transport streams in a broadcast environment is to decode each transport stream into a respective... ...transport stream, and re-encode the video frames and audio signals to produce

the spliced **MPEG** transport stream. However, the computational and storage resources needed for decoding the **MPEG** transport streams and encoding the spliced video frames and audio signals can be avoided using... ...procedure described below.

In the switch 70, a de-multiplexer 77 switches from a current **MPEG** transport stream to a new **MPEG** transport stream. The **MPEG** transport stream selected by the multiplexer 77 is received by an **MPEG** splicer 78, which performs seamless splicing as described below, The **MPEG** splicer 78 includes a central processor unit (CPU) and random access memory 80. The random access memory provides buffering of the **MPEG** transport stream selected by the multiplexer 77 so that at the time ...splicing, the splicer 78 will have in the memory 80 a portion of the current **MPEG** transport stream near the splice point, and a beginning portion of the new **MPEG** transport stream. The splicer 78 outputs a spliced **MPEG** transport stream that can be transmitted to customers, for example, from a broadcast antenna 81.

With reference to FIG. 4, there is shown a block diagram of an **MPEG** decoder. The decoder includes a demultiplexer 90, which receives a transport stream (**TS**) of packets. The demultiplexer extracts a stream of video packetized elementary stream (V-**PES**) packets, and two streams of audio packetized elementary stream (A- **PES**) packets. A video buffer 91 receives the stream of V- **PES** packets, a first audio buffer 92 receives the first stream of A-**PES** packets, and a second audio buffer 93 receives the second stream of A-**PES** packets. A video decoder 94 receives the V-**PES** packets from the video buffer 91 and produces video presentation units (VPUs). Each VPU, for... ...intensity of each pixel in a video frame. A first audio decoder 95 receives A-**PES** packets from the first audio buffer 92 and produces audio presentation units (APUs) for a... ...of audio samples over an interval of time. A second audio decoder 96 receives A-**PES** packets from the second audio buffer 93 and produces APUs for a second audio channel... ...second channels, for example, are right and left stereo audio channels.

For seamless splicing of **MPEG** transport streams, it is not necessary to decode the video and audio elementary streams down... ...with as little complexity as possible.

FIG. 5 is a diagram showing thesyntax of the **MPEG**-2 Transport Stream. This diagram is a relevant portion of Figure F.1 of Annex F of the **MPEG**-2 standards document ISO/IEC 13818-1. The **MPEG**-2 Transport Stream is comprised of a series of 188 byte **TS** packets, each of which may include video, audio, or control information. Seamless splicing, as described... ...PCR) time stamp again provided in the adaptation field. If the data of a video **PES** packet or audio **PES** packet starts in the payload of a **TS** packet, then the payload unit start indicator bit is set to a one. Otherwise, if the **TS** packet contains the continuation of an already initiated audio or video **PES** packet, then the payload unit start indicator bit is set to zero. Very typically the payload unit start indicator will be changed by setting it to one at the first **TS** packet of the audio for the second stream in the spliced Transport Stream. The original... ...of the second stream are modified so that the continuity counter values in the spliced **TS** have consecutive values. The adaptation field length in the adaptation fields of the last audio **TS** packet in the first stream and also the first audio **TS** packet in the second stream within the spliced **TS** will typically need to be modified during splicing in order to insert some stuffing bytes... ...packets. The original PCR values from the second stream are uniformly incremented in the spliced **TS**.

FIG. 6 is a diagram showing the syntax of an **MPEG**-2 **PES** packet. This diagram is a relevant portion of Figure F.2 of Annex F of the **MPEG**-2 standards document ISO/IEC 13818-1. The **MPEG**-2 **PES** packet may include video, audio, or control information.

Seamless splicing, as described below, may involve modification of the **PES** packet length, and the data alignment indicator and presentation time stamp (PTS) and decode time stamp (DTS) in the **PES** header During splicing, the **PES** packet length typically has to be modified for the audio, in two places. The first is the last audio **PES** packet of the first stream, where the information about the size often has to be changed. The size should refer to the bytes preserved in these two audio **PES** packets after editing for splicing is made. The data alignment indicator may also change in the first audio **PES** packet of the second stream due to deletion of some obsolete audio access units. The original PTS and DTS values from the second stream are uniformly incremented in the spliced **TS**.

In general, splicing of **MPEG**-2 Transport Streams involves selecting an end point in a first **MPEG**-2 **TS** stream, selecting a beginning point in a second **MPEG**-2 **TS** stream, combining the content of the first **TS** stream prior in presentation order to the end point with the content of the second **TS** stream subsequent in presentation order to the beginning point. Unfortunately, the **TS** streams are formatted so that the presentation order is often different from the order in which the content appears in the **TS** streams. In particular, transport packets including audio information are delayed with respect to corresponding transport packets of video information. Moreover, as noted above, the B frames appear in the **TS** streams in reverse of their presentation order with respect to the reference frames that immediately... ...the first Transport Stream prior to the end point has been parsed into a video **PES** stream 111 and an audio **PES** stream 112, and the portion of the second Transport Stream after the beginning point has been parsed into a video **PES** stream 113 and an aligned audio **PES** stream 114. The two video **PES** streams 111, 113 have been jointed together at a dashed cut line 115, and the two audio **PES** streams have been also joined at the dashed cut line 115. The natural cut point for the audio stream, however, is not between video **PES** boundaries, and instead it is between audio access units (AAU) which are decoded to produce... ...a reformatting operation. in which the spliced Transport Stream is produced from the parsed video **PES** stream and the parsed audio **PES** stream. Typically the reformatting operation will slightly shift the alignment of the audio presentation units... ...units.

As shown in FIG. 9, the AAUs are not necessarily aligned on the audio **PES** packet boundaries in the elementary stream. There may be fractions of an AAU at the beginning 116 and/or end 117 of the **PES** packet payload. The parsing and the reformatting operations take into account this non-alignment of the AAUs with the **PES** packet boundaries. Each AAU, for example, has 576 bytes, and decodes to a 24 millisecond... ...the APUs because the audio and video frame durations are substantially incommensutrate. For example, an **MPEG**-2 **TS** encoding an NTSC television program with an audio sampling frequency of 48 kHz and audio... ...they will not be aligned again for all practical purposes.

The splicing point between two **MPEG**-2 Transport Streams is naturally defined with respect to VPUs. The splicing point, for example... ...end of the VPU for an Out Point (I or P frame) in the first **TS**, and at the beginning of the VPU for an In Point (I frame of a closed GOP) in the second **TS**. For splicing, the time base of the second **TS** is shifted to achieve video presentation continuity.

Because the AAUs are usually not aligned with... ...an issue with respect to the selection of AAUs to be included in the spliced **TS**. In general, audio truncation (i.e., positioning of the cut with respect to the stream of AAUs in the first and second **TS**) should always be done at the AAU boundaries. Fractional AAUs are useless because the audio... ...precisely specify which AAUs should be selected near the cut for inclusion in the spliced **TS**.

A more precise set of rules for selection of AAUs near the cut takes into...are not provided for each AAU but rather specified in the header field of audio **PES** packets for the first AAU commencing in the payload of the **PES** packet, the above mentioned re-stamping is achieved by modifying only these specified presentation time stamps. Further processing is required at the elementary stream level for modifying the audio **PES** packet carrying the best aligned final APU, and modifying the audio **PES** packet carrying the best aligned initial APU, The audio **PES** packet carrying the best aligned final APU is modified by truncation of AAU data after the AAU associated with the best aligned final APU, and modifying the **PES** packet size (in the corresponding **PES** packet header field) accordingly. The audio **PES** packet carrying the best aligned initial APU is modified by deleting the AAU data preceding the AAU associated with the best aligned initial APU, and modifying the **PES** packet size (in the corresponding **PES** packet header field) accordingly. In addition and as mentioned above, the audio **PES** packet carrying the best aligned initial APU and all subsequent audio

PES packets are modified by re-stamping their PTS values to follow in sequence from the PTS value of the audio **PES** packet carrying the best aligned final APU. The cases in FIGS. 11A and 17A involve...by the audio splicing procedure described above. The resulting audio stream is error-free and **MPEG**-2 compliant.

The audio and video elementary streams must be recombined around and following the... ...of spliced Transport Stream around and following the splice point. The truncation of the final **PES** packet of the first audio stream will typically necessitate the insertion of some adaptation field... ...deletion of some AAU data from the beginning of the second audio stream's initial **PES** packet will typically necessitate the editing of at most two audio transport packets.

In any **MPEG**-2 Transport Stream, the audio bit rate, over the span of a few VAU durations... ...buffering and re-multiplexing. The delayed audio packets near the Out Point in the first **TS** stream are temporarily stored in a buffer when the first **TS** stream is truncated based on the VAU of the Out Point. Also, the spliced **TS** is reformatted by deletion of some obsolete audio packets at the beginning of the second... ...some audio packets of the first stream just following the Out Point into the spliced **TS**.

With reference to FIG. 19, there is shown a top-level flow chart of the preferred procedure for splicing **MPEG** Transport Streams. At least the portions of a first and second **MPEG TS** stream around the Out Point and In Point, respectively, are assumed to be stored in a buffer. The stored **MPEG TS** data for the first stream will be referred to as a first clip, and the stored **MPEG TS** data for the second stream will be referred to as a second clip.

In a... ...several constraints. The buffer should be assumed to have a certain size defined in the **MPEG**-2 standard. The decoder buffer should neither overflow nor underflow. Furthermore, the decoder cannot decode ... ...NTSC, the decoder must have access to a full picture ready to be decoded.

The **MPEG** encoder manages the video decoder buffer through decode time stamps (DTS), presentation time stamps (PTS...a subsequent location of the second clip. If the second clip is encoded by an **MPEG**-2 compliant encoder, then video buffer underflow or buffer overflow will not occur at any...154, while keeping the DTS-PCRc)) relationship unaltered, the procedure finds the time instant, designated **TS**)), at which the first byte of the second clip should arrive. This is done by calculating TSTART))=DTSF2))-PCRc2)), and **TS**))=DTSF1))-TSTART)).

Continuing in FIG. 24, in step 155, execution branches depending on whether **TS**)) is equal to Te)) plus 8 divided by the bit rate. If not, then the... ...concatenation, and execution branches to step 156. In step 156, execution branches depending on whether **TS**)) is less than Te)) plus 8 divided by the bit rate. If not, then there... ...gap. The gap to be compensated has a number of bytes, designated Gr)), equal to (**TS**))-Tc)))(BIT RATE)/8 minus one. If in step 156, **TS**)) is less than Te)) plus 8 divided by the bit rate, then execution continues from... ...158 to open up a certain amount of space in the first clip to achieve **TS**))=Te))+8/(BIT RATE). The number of bytes to drop is one plus (Tc))-**TS**)))(BIT RATE)/8. If possible, the bytes are dropped by removing null packets. Otherwise, one... ...predicted video frames are replaced with smaller, variable-size freeze frames.

If in step 155 **TS**)) is found to be equal to Te)) plus 8 divided by the bit rate, then... ...clip after the best aligned AAU in the first clip, and adjusts the last audio **PES** packet header in the first clip to reflect the change in its size in bytes after the removal. In FIG. 26, step 178, the procedure finds the audio **PES** packet in the second clip which includes the best aligned AAU in the second clip, and removes all AAUs preceding the best aligned one in this **PES** packet. Then in step 179, the procedure produces a **PES** packet header to encapsulate the best aligned AAU and the AAUs alter it, and writes the **PES** packet size into the header. Finally, in step 180, the procedure calculates the required audio...can also be used for splicing other elementary streams containing encapsulated data. For example, a **TS** may have additional elementary streams of other data encapsulated in access units such as access units for teletext, closed captioning, VBI, ete. To apply the seamless splicing method to a **TS** having multiple elementary streams of non-video and non-audio access units, the AU's... ...to associated video frames and also prevent accumulation of skew from multiple splices in the **TS**.

With reference to FIG. 38, there is shown a flow chart of a procedure for...time stamp offset VOFFSET)) is added to the DTS and PTS fields of all video **PES** packets in the second clip. Next, in step 242, the audio time stamp offset AOFFSET)) is added to the PTS fields of all audio **PES** packets in the second clip. In step 243, the PCR time stamp offset PCROFFSET)) is... ...all PCR records in the second clip. In step 245 the PID fields of the **TS** packets of the various streams in the second clip are re-stamped based on their... ...streams of the first clip. Finally, in step 246, the continuity counter fields of the **TS** packets of the various streams are re-stamped in the second clip so as to... ...relies on null motion vectors and no coded transform coefficients. Consequently, these frames are completely **MPEG**-2 compliant and the decoder doesn't encounter any discontinuity in the stream.

With these... ...is shown a diagram of the pixels in a video frame 250. According to the **MPEG** video encoding standard, the video frame can be subdivided into a rectangular array of macroblocks... ...macroblock horizontal and vertical sizes by right-most column and lowermost row reptitions respectively. The **MPEG** standard also permits slices, or linear arrays of contiguous macroblocks, to be defined, with the...5).

With reference to FIG. 43, there is illustrated a problem of non-obsolete audio **TS** packets 260 that follow in the first clip after the end 261 of the video **TS** packet for the Out Point, and null **TS** packets 262 and obsolete audio packets 263 in the second clip after the beginning of the video **TS** packet for the In Point. It is desired to replace as many of the null **TS** packets 262 and obsolete audio packets 263 as possible with the non-obsolete audio packets... ...repositioned into existing packet positions in the second clip after the beginning of the video **TS** packet for the In Point, then the placement of these remaining non-obsolete audio **TS** packets may affect the DTSF2))-PCRc2)) relationship of the In Point of the second clip or

the **TS**)) = Te)) + 8/(bit rate) relationship that needs to be satisfied for seamless video splicing. In... ...procedure of a re-formatting operation that solves the problem of the non-obsolete audio **TS** packets 260 that follow in the first clip after the end 261 of the video **TS** packet for the Out Point. In a first step 271, the procedure determines the number (designated "j") of non-obsolete audio packets in the first **TS** stream or clip following the end of the video at the Out Point, and the total number (designated "k") of null packets and obsolete audio packets in the second **TS** stream or clip following the beginning of video at the In Point and up to the first non-obsolete audio packet in the second **TS**. Next, in step 272, the procedure replaces any of the "k" null packets or obsolete audio packets in the second **TS** stream with corresponding ones of the "j" non-obsolete audio packets in the first **TS** stream, beginning with the most advanced in time packets. Then, in step 273, the procedure... ...then all of the non-obsolete audio packets following the Out Point from the first **TS** stream have been inserted into the second **TS** stream following the In Point so that they no longer constitute a problem for the... ...case, execution branches to step 274 to change any remaining obsolete audio packets to null **TS** packets, and (he reformatting procedure of FIG. 44 is finished.

If "j" is greater than... ...the procedure creates (j-k)*)188 bytes of additional space for them in the spliced **TS** stream prior to the video for the Out Point. This additional space must be generated so as to maintain the **Ts** =Te+8/(bit rate) condition of FIG. 24 for seamless video splicing. This additional space can be entirely or partially provided by the space of the null **TS** packets created in step 157, in which case these null **TS** packets are replaced with non-obsolete audio packets. Any remaining ones of the non-obsolete... ...275, the re-formatting routine of FIG. 44 is finished.

The reformatting of the spliced **TS** stream after concatenation also includes steps to ensure the continuity of associated individual streams across... these B frames without artifacts. They must be removed. However, in order to keep an **MPEG**-2 compliant stream and also to preserve frame accuracy, these B frames are replaced by... ...the seamless splicing must be done on the fly, during real-time delivery of a **TS** stream. For example, a stream server of the video file server 20 of FIG. 1 performs metadata computation (281 in FIG. 45) when the file server records the **MPEG TS** stream in a **MPEG** file 282. As the **MPEG TS** data 285 becomes recorded in the **MPEG** file 282, the metadata is recorded in a header of the **MPEG** file. The header, for example, is a first megabyte of random-accessible address space in... ...number of GOPs in the clip, stream identifiers for the various elementary streams in the **TS**, a byte index indicating a beginning position of the clip in the file, and a...index table may store the values of predefined attributes of each GOP included in the **MPEG TS** data. However, it is desirable to permit any number of the GOPs having recorded **MPEG TS** data 285 to have GOP index table entries that are empty of valid metadata values... ...GOP index table 284. The GOP index table includes an entry for each GOP having

MPEG TS data recorded in the **MPEG** file. Each entry is a row in the table, and the table is indexed implicitly ... ...of the first video frame in the GOP, a pointer to the beginning of the **MPEG TS** data for the GOP, a set of flags for the GOP, and other GOP attributes... ...average bit rate, the AAU size in bytes, the APU duration in seconds, the audio **PES** packet starting locations, the AAU starting locations, the AAU PTS values, the PCRe)) of the... ...GOP index table can be decimated to reduce its size. For example, if so much **MPEG TS** data becomes written to the **MPEG TS** file that there is insufficient space in the 1 megabyte header to hold entries for... ...by the decimation factor.) Computation of attribute values for the GOPS found in an ingested **TS** and the writing of those attribute values to respective entries in the GOP index continues... ...clip is a low priority item. The frame number and the

pointer to the corresponding **MPEG TS** data (i.e., a byte index) are high priority GOP attributes. The flag indicating whether... ...is shown a flow chart of metadata computations for a next GOP processed in a **TS**. In a first step 341, if resources available for computing high priority metadata are not... ...344, where the low priority metadata is computed for the GOP.

The GOPs in a **TS** can be fixed size (same size throughout the **TS**) or variable size in terms of the number of video frames they contain. If the... ...number of "n" frames. In this case, assuming that the first frame number in the **TS** is "m", then the number of the GOP containing a specified frame "p" can be...49, there are shown further details of the components involved in the ingestion of an **MPEG TS** into a stream server computer 291 for recording in the cached disk array, and for real-time splicing during real-time transmission of an **MPEG TS** from the cached disk array and from the stream server computer to a destination such... ...the random access memory 294 of the stream server computer 291 in order to exchange **MPEG TS** data with the network (25 in FIG. 1). A software driver 295 for the network... ...range of the data in the buffer for the DMA transfer. Realtime delivery of an **MPEG TS** stream from the stream server 291 is controlled by a "house" clock signal 55. As... ...be available when the interrupt is expected to occur. In either casc, when transmitting an **MPEG TS**, the data must be delivered to ensure that any jitter is within the limit that the **MPEG** standard imposes on the PCR time values The PCR values must be accurate within 20... ...of a 27 MHz decoder clock. Moreover, the difference between neighboring PCR values in the **TS** is kept less that 100 msec; otherwise, the decoder clock will reset.

When ingesting an **MPEG TS** from the network (25 in FIG. 1), once an assigned one of the buffers 293 is tilled with **MPEG TS** data, the software driver 295 inserts a pointer to the filled buffer into a FIFO... ...and services the queue by obtaining the buffer pointer from the queue and accessing the **MPEG TS** data in the buffer 293 indicated by the pointer. The metadata computed by the program... ...from the queue 298, and then writes the data from the indicated buffer to an **MPEG TS** file of the file system 300. The file system 300 writes the data to the...these operations of the stream server computer 291.)

To perform splicing or other real-time **MPEG** processing during real-time delivery of an **MPEG TS** to the network (25 in FIG. 1), a read access program module 301 invokes the file system 300 to read the **MPEG TS** data from an **MPEG TS** file in the cached disk array 23 in an asynchronous read operation upon data storage in the cached disk array, and the read access program module writes the **MPEG TS** data into an assigned one of the buffers 293. When the read access program 301... ...it places a pointer to the buffer on a FIFO buffer pointer queue 302. An **MPEG** processing program module 303 services the queue 302. Upon finding that the queue 302 is... ...the queue 302 and accesses the buffer 293 indicated by the pointer.

For splicing, the **MPEG** processing module 303 will access two consecutive buffers, one containing a first clip and the... ...first clip in its assigned buffer so that the first clip will represent the spliced **TS**. Splicing in real time requires parsing the **TS** stream in real time for audio **PES** packet headers, and parsing the audio **PES** packets in real time for the AAUs Also the **TS** stream is parsed in real time to find the GOP header and to extract the... ...non-obsolete AAUs are reformatted and the obsolete AAUs are eliminated in real time. The **TS** stream around the splice point is modified in real time for seamless video splicing. The time stamp offsets are computed and the spliced **TS** stream following the splice point has all of its time stamps and continuity counters re-stamped in real lime.

When the **MPEG** processing module 303 is finished with the splicing operation, it places the pointer to the buffer of the spliced **TS** into yet another FIFO buffer pointer queue 304. The queue 304 is serviced by the... ...causes the network interface board to initiate a direct memory access transfer of the spliced **TS** from the indicated buffer 293 to the network (25 in FIG. 1). The **TS** data is buffered from the **MPEG** processing to the network interface board because the network interface board has priority access to... ...operations of the stream server computer 291.)

It is also possible for the new spliced **TS** to be stored in the cached disk array 23, with or without concurrent transfer to... ...seen that the buffers 293 function as a kind of carousel to distribute clips and **MPEG TS** streams data to successive processing, storage, and stream delivery functions, and the **MPEG TS** streams can be easily edited and spliced in the process.

The number of buffers 293... ...allocated for use in the carousel during the reading, writing, or generation of a spliced **TS** is a function of the bit rate of the **TS**. A higher bit rate requires more buffers. Each buffer, for example, has 64 kilobytes of... ...the usual case where each buffer has a size smaller than the duration of the **TS**. The parsing counts frames, builds GOP entries, calculates instantaneous bit rates and other GOP attributes, and looks for error conditions. Each GOP **header** is **parsed** for display order and type (i.e., open or closed).

The **MPEG** processing 303 may use a number of flags. These **MPEG** processing flags include the following:

- 0x100: re-stamp time records flag

If this flag is... ...flag

If this flag is set, the discontinuity flag of the adaptation field in the **TS** packet headers is set following the splicing point.

- 0x1000: rate-based padding flag

This bit is not used by the **MPEG** processing itself. If padding is necessary since the session bit-rate is greater than the...illustrates a metered file transfer protocol (FTP). This protocol is useful for transfer of an **MPEG TS** stream from the video file server (20 in FIG. 1) to an application 310. The... ...used to recover from failure conditions that may destroy or corrupt a portion of an **MPEG** transport stream. For example, a component of a data path in the cached disk array may fail, causing an **MPEG TS** from a disk drive in the cached disk array to be interrupted for a short period of time while the failure condition is diagnosed and the **MPEG TS** is re-routed to bypass the failed component. As shown in the flow chart of FIG. 52, the **MPEG** processing module may be programmed to recognize the failure (step 351) during the delivery of the **MPEG TS** to a client (step 352). Once this failure is detected, the **MPEG** processing module 303 can fill in this gap in the **MPEG TS** with null packets or freeze frames with correct PCR values (step 353). By inserting correct... ...will not reset and can be kept in a ready state. Once delivery of the **MPEG TS** to the **MPEG** processing module is reestablished (as detected in step 354), the **MPEG** processing module seamlessly splices (step 355) the re-established **TS** (as if it were a second stream or clip) to the **TS** of null packets or freeze frames that it has been generating and sending to the... ...the switch of FIG. 3 to compensate for temporary interruptions in the delivery of an **MPEG TS** to the set-top decoder box or to the switch.

In a similar fashion, the **MPEG** processing module in batch mode could check a clip for any damaged portions, and once... ...mode processing, with audio and video buffer simulators, could also measure the quality of spliced **TS** streams and determine whether or not the splices should be repaired using the more accurate... ...include an analysis of audio delay or skew; how many freeze frames are in the **TS** stream and their clustering, and an analysis of PCR jitter. It would also be very easy for the **MPEG** processing module to compute the audio skew and PCR jitter in real time during the real-time transmission of an **MPEG TS**, and to display continuous traces of the audio skew and PCR jitter to a system... ...visual transport streams, including predictive analysis performed upon encoded digital motion video (such as an **MPEG** Transport Stream). The predictive analysis includes estimation of upper and lower bounds of the data... ...the decoder buffer levels for every single Elementary Stream (ES) component of a Transport Stream (**TS**), and identification of valid splicing In Points and Out Points based on the predicted buffer ...

Claims: ...wherein the first transport stream, the second transport stream, and the spliced transport stream are **MPEG**-2 compliant.

9. The method as claimed in claim 1, which includes skewing, in the...transport stream.

21. The method as claimed in claim 17, which includes computing a time (**Ts**))) at which a first byte for the first video frame of the second transport stream... ...video decoder buffer where T5))=DTSF1))-DTSF2))+PCRe2)), and computing a difference between Te)) and **Ts**)) to compute an amount of data that is removed from at least one video access... ...wherein the first transport stream, the second transport stream, and the spliced transport stream are

MPEG-2 compliant.

26. The method as claimed in claim 17, wherein the first transport stream...

13/3K/4 (Item 1 from file: 349) Links
Fulltext available through: Order File History
PCT FULLTEXT

01762172
DIGITAL BROADCASTING SYSTEM AND DATA PROCESSING METHOD
SYSTEME DE DIFFUSION NUMERIQUE ET PROCEDE DE TRAITEMENT DE DONNEES

Patent Applicant/Patent Assignee:

- **LG ELECTRONICS INC**
  20, Yeouido-dong, Yeongdeungpo-gu, Seoul 150-721; KR; KR (Residence); KR (Nationality); (For all designated states except: US)

Patent Applicant/Inventor:

- **SONG Jae Hyung**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **CHOI In Hwan**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **HONG Ho Taek**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **KWAK Kook Yeon**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **KIM Byoung Gill**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **SUH Jong Yeul**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **KIM Jin Pil**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **SONG Won Gyu**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **LEE Chul Soo**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)

- **KIM Jin Woo**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **LEE Hyoung Gon**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)
- **LEE Joon Hui**
  Lg Electronics Inc. Ip Group, 16 Woomyeon-Dong, Seocho-Gu, Seoul 137-724; KR; KR (Residence); KR (Nationality); (Designated only for: US)

Legal Representative:

- **KIM Yong In et al(agent)**
  KBK & Associates 15th Floor, Yosam bldg., 648-23, Yeoksam-dong, Kangnam-ku, Seoul 135-748; KR;

	Country	Number	Kind	Date
Patent	WO	200902095	A1	20081231
Application	WO	2008KR3652		20080625
Priorities	US	2007946141		20070625
	US	2007957714		20070824
	US	2007974084		20070921
	US	2007977379		20071004
	KR	1020080059857		20080624

Designated States: (All protection types applied unless otherwise stated - for applications 2004+)
AE; AG; AL; AM; AO; AT; AU; AZ; BA; BB;
BG; BH; BR; BW; BY; BZ; CA; CH; CN; CO;
CR; CU; CZ; DE; DK; DM; DO; DZ; EC; EE;
EG; ES; FI; GB; GD; GE; GH; GM; GT; HN;
HR; HU; ID; IL; IN; IS; JP; KE; KG; KM;
KN; KP; KZ; LA; LC; LK; LR; LS; LT; LU;
LY; MA; MD; ME; MG; MK; MN; MW; MX; MY;
MZ; NA; NG; NI; NO; NZ; OM; PG; PH; PL;
PT; RO; RS; RU; SC; SD; SE; SG; SK; SL;
SM; SV; SY; TJ; TM; TN; TR; TT; TZ; UA;
UG; US; UZ; VC; VN; ZA; ZM; ZW;

[EP] AT; BE; BG; CH; CY; CZ; DE; DK; EE; ES;
FI; FR; GB; GR; HR; HU; IE; IS; IT; LT;
LU; LV; MC; MT; NL; NO; PL; PT; RO; SE;
SI; SK; TR;

[OA] BF; BJ; CF; CG; CI; CM; GA; GN; GQ; GW;
ML; MR; NE; SN; TD; TG;

[AP] BW; GH; GM; KE; LS; MW; MZ; NA; SD; SL;

SZ; TZ; UG; ZM; ZW;

[EA] AM; AZ; BY; KG; KZ; MD; RU; TJ; TM;

Publication Language: English
Filing Language: English
Fulltext word count: 77266

Detailed Description:

...illustrates examples of the fixed-/mobile-Rx broadcast programs which are transmitted according to the **MPEG**-2 **TS** and the IP schemes, and is a concep-tualdiagram of an example in which broadcast service data is transmitted over a single physical channel;

[88] FIG. 76 illustrates that the **MPEG**-2 **TS**-based service and the IP-based service are si multaneously transmitted over a single virtual ... ...and mobile service data;

[96] FIG. 85 is a flow chart illustrating a process for **parsing** the program table in formation of FIGS. 83 and 84

[97] FIGS. 86 and 87... ...A/V codec that is used for a conventional main service cor responds to a **MPEG**-2 codec, a **MPEG**-4 advanced video coding (AVC) or scalable video coding (SVC) having better image compression efficiency ... ...in a time region. Referring to FIG. 3 and FIG. 4, a 38th data packet (**TS** packet #37) of a 1st slot (Slot #0) is mapped to the 1st data packet of an odd VSB field. A 38th data packet (**TS** packet #37) of a 2nd slot (Slot #1) is mapped to the 157th data packet of an odd VSB field. Also, a 38th data packet (**TS** packet #37) of a 3rd slot (Slot #2) is mapped to the 1st data packet of an even VSB field. And, a 38th data packet (**TS** packet #37) of a 4th slot (Slot #3) is mapped to the 157th data packet...multiplexer. For example, an interface standard such as a synchronous serial interface for transport of **MPEG**-2 data (SMPTE-310M). In the SMPTE-310M interface standard, a constant data rate is... ...is 38.78 Mbps. Furthermore, in the conventional 8VSB mode transmitting system, a transport stream (**TS**) packet having a data rate of approximately 19.39 Mbps may be transmitted through a... ...the additionally encoded mobile service data are multiplexed with the main service data to a **TS** packet form, which is then transmitted.

At this point, the data rate of the multiplexed **TS** packet is approximately 19.39 Mbps.

[140] At this point, the service multiplexer 100 receives... ...table data for each mobile service so as to encapsulate the received data to each **TS** packet. Also, the service multiplexer 100 receives at least one type of main service data... ...table data for each main service and encapsulates the received data to a transport stream (**TS**) packet. Subsequently, the **TS** packets are mul tiplexed according to a predetermined multiplexing rule and outputs the multiplexed packets... ...The transport multiplexer 160 may include a main service multiplexer 161 and a transport stream (**TS**) packet multiplexer 162.

[145] Referring to FIG. 14, at least one type of compression encoded... ...161 encapsulates each of the inputted main service data and PSI/PSIP table data to **MPEG**-2 **TS** packet forms. Then, the **MPEG**-2 **TS** packets are multiplexed and outputted to the **TS** packet multiplexer 162. Herein, the data packet being outputted from the main service multiplexer 161... ...150

encapsulates each of the inputted mobile service data and PSI/PSIP table data to **MPEG**-2 **TS** packet forms. Then, the **MPEG**-2 **TS** packets are multiplexed and outputted to the **TS** packet multiplexer 162. Herein, the data packet being outputted from the mobile service multiplexer 150... ...the mobile service data and the PSFPSIP table data that are being inputted to a **MPEG**-2 **TS** packet form. Then, the above-described **TS** packets are multiplexed with the null data packets and, then, outputted to the **TS** packet multiplexer 162.

[160] Thereafter, the **TS** packet multiplexer 162 multiplexes the main service data packet being outputted from the main service... ...present invention. In other words, according to another em-bodiment of the present invention, the **TS** packet multiplexer 162 may receive the null data packets, so as to match the data... ...service multiplexer 150, the main service multiplexer 161 of the transport multiplexer 160, and the **TS** packet multiplexer 162, and also controls the null data packet generation of the null packet... ...and managing the transmitting system. For example, the OMP is configured in accordance with the **MPEG**-2 **TS** packet format, and the corresponding PID is given the value of Ox IFFA. The OMP... ...to configure a data group. Thereafter, known data, mobile service data, RS parity data, and **MPEG** header are allocated to pre determined regions within the data group.

[174]

[175] Pre-processor...packet" for simplicity. For example, the inputted mobile service data may correspond either to an **MPEG** transport stream (**TS**) packet configured of 188-byte units or to an IP datagram. Alternatively, the IP datagram may be en capsulated to a **TS** packet of 188-byte units and, then, inputted.

[201] When the mobile service data that are being inputted correspond to a **MPEG** transport packet stream configured of 188-byte units, the first synchronization byte is removed so... ...when the input mobile service data of the RS frame do not correspond to the **MPEG** **TS** packet format, the mobile service data are inputted N number of times in 187-byte units without being processed with the removing of the **MPEG** synchronization byte, thereby creating a RS frame.

[202] In addition, when the input data format of the RS frame supports both the input data corresponding to the **MPEG** **TS** packet and the input data not corresponding to the **MPEG** **TS** packet, such information may be included in a transmission parameter transmitted from the service multiplexer... ...to be able to control whether or not to perform the process of removing the **MPEG** syn chronization byte. Also, the transmitter provides such information to the receiving system so as to control the process of inserting the **MPEG** synchronization byte that is to be performed by the RS frame decoder of the receiving...mobile service data outputted from the block processor 302, the group formatter 303 also inserts **MPEG** header place holders, non-systematic RS parity place holders, main service data place holders, which... ...For example, based upon the data outputted after data deinterleaving, the place holder for the **MPEG** header may be allocated at the very beginning of each packet. Also, in order to... ...inputted. Then, the packet formatter 305 groups the remaining portion and inserts the 3-byte **MPEG** header place holder in an **MPEG** header having a null packet PID (or an unused PID from the main service data... ...group, as described above, as a 188-byte unit mobile service data packet (i.e., **MPEG** **TS** packet), which is then provided to the packet multiplexer 240.

[270] Based upon the control... ...of the main service data packet becomes relative. Also, a system object decoder (i.e., **MPEG** decoder) for processing the main service data of the receiving system, receives and decodes only... ...The PCR value corresponds to a time reference value for synchronizing the time of the **MPEG** decoder. Herein, the PCR value is inserted in a specific region of a **TS** packet and then transmitted.

[275] In the example of the present invention, the packet jitter... ...pre-processor 230, the data randomizer 251 deletes the synchronization byte from the 4-byte **MPEG** header included in the mobile service data packet and, then, performs the randomizing process only on the remaining 3 data bytes of the **MPEG** header. Thereafter, the randomized data bytes are outputted to the RS encoder/non-systematic RS ... ...process is not performed on the remaining portion of the mobile service data excluding the **MPEG** header. In other words, the remaining portion of the mobile service data packet is directly...decoder 1005 removes the known data, data used for trellis initialization, and signaling information data, **MPEG** header, which have been inserted in the data group, and the RS parity data, which... ...service data, but may also include mobile service data, known data, RS parity data, and **MPEG** headers.

[553] Among the soft decision values of TDL size of the trellis decoding unit...main service data places, known data places, signaling information places, RS parity data places, and **MPEG** header places), which are removed by the outer block extractor 4014, thereby being outputted to... ...data deinterleaver 501 1, the packet deformatter 5012 removes the place holder corresponding to the **MPEG** header, which had been inserted to the packet formatter 305. The output of the packet... ...service data, as well as mobile service data, known data, RS parity data, and an **MPEG** header. At this point, among the inputted data, only the main service data and the... ...bitwise exclusive OR (XOR) operation on the generated pseudo random data byte, thereby inserting the **MPEG** synchronization bytes to the beginning of each packet so as to output the data in... ...correcting the errors within the RS frame. Thereafter, the RS frame decoder 1006 adds 1 **MPEG** synchronization data byte to the error-correction mobile service data packet. In an earlier process, the 1 **MPEG** synchronization data byte was removed from the mobile service data packet during the RS frame... ...outputted by the order of N number of 187-byte units. At this point, 1 **MPEG** synchronization byte, which had been removed by the transmitting system, is added to each 187...users. Examples of the encoding/decoding scheme for the audio data may include AC 3, **MPEG** 2 AUDIO, **MPEG** 4 AUDIO, AAC, AAC+, HE AAC, AAC SBR, **MPEG**-Surround, and BSAC. And, examples of the encoding/decoding scheme for the video data may include **MPEG** 2 VIDEO, **MPEG** 4 VIDEO, H.264, SVC, and VC-I.

[604] Depending upon the embodiment of the... ...service data. Thereafter, the identified main service data and mobile service data are outputted in **TS** packet units. An example of the demodulating unit 6002 is shown in FIG. 36 to... ...wherein the encoder may be embodied as one of software, middleware, and hardware. Herein, an **MPEG** encoder may be used as the encoder according to an em bodiment of the present... ...table format may be applied in the present invention.

[612] The PSI table is an **MPEG**-2 system standard defined for identifying the channels and the programs. The PSIP table is... ...system used by the transmitting system. The PMT transmits PID information of a transport stream (

TS) packet, in which program identification numbers and individual bit sequences of video and audio data... ...channel.

[619] The program
number field is shown for connecting the virtual channel having an **MPEG**-2 program association table (PAT) and program map table (PMT) defined therein, and the program... ...IEC 13818-1 private sections, ITU-T Rec. H.222.0 IISO/IEC 13818-1 **PES** packets containing private data, ISO/IEC 13522 MHEG, ITU-T Rec. H.222.0 IISO... ...decoding process. Other stream types that may be applied in the present invention may include **MPEG** 4 AUDIO, AC 3, AAC, AAC+, BSAC, HE AAC, AAC SBR, and **MPEG**-S for the audio data, and may also include **MPEG** 2 VIDEO, **MPEG** 4 VIDEO, H.264, SVC, and VC-I for the video data.

[626] Furthermore, referring... ...Non-hierarchical mode and the MPH-audio stream : Non-hierarchical mode, examples of using the **MPEG** 4 AUDIO, AC 3, AAC, AAC+, BSAC, HE AAC, AAC SBR, and **MPEG**-S for the audio data, and the **MPEG** 2 VIDEO, **MPEG** 4 VIDEO, H.264, SVC, and VC-I for the video data may also be... ...for' loop repetition statement includes at least one of an AC-3 audio descriptor, an **MPEG** 2 audio descriptor, an **MPEG** 4 audio descriptor, an AAC descriptor, an AAC+ descriptor, an HE AAC descriptor, an AAC SBR-de scriptor, an **MPEG** surround descriptor, a BSAC descriptor, an **MPEG** 2 video de scriptor, an **MPEG** 4 video descriptor, an H.264 descriptor, an SVC descriptor, and a VC-I descriptor... ...the mobile service data (or program number). The PMT may include the PID of the **TS** packet used for transmitting the mobile service data. The VCT may include in formation on the virtual channel for transmitting the mobile service data, and the PID of the **TS** packet for transmitting the mobile service data.

[632] Meanwhile, depending upon the embodiment of the... ...the service name and different pa rameters associated with each service corresponding to a particular **MPEG** multiplex.

The EIT is used for transmitting information associated with all events occurring in the **MPEG** multiplex. The EIT includes information on the current transmission and also includes information selectively containing... ...is preferable that the mobile service data included (or loaded) in a payload within a **TS** packet correspond to **PES** type mobile service data. According to another embodiment of the present invention, when the mobile... ...service (or data service data), the mobile service data included in the payload within the **TS** packet consist of a digital storage media-command and control (DSM-CC) section format. However, the **TS** packet including the data service data may correspond either to a packetized elementary stream (**PES**) type or to a section type. More specifically, either the **PES** type data service data configure the **TS** packet, or the section type data service data configure the **TS** packet. The **TS** packet configured of the section type data will be given as the example of the... ...CC) section. Herein, the DSM-CC section is then configured of a 188-byte unit **TS** packet.

[635] Furthermore, the packet identification of the **TS** packet...carousel.

The original
network
id field indicates a DVB-SI original
network

id of the **TS** providing transport connection. The transport
stream
id field indicates the **MPEG TS** of the **TS** providing transport connection, and the service id field indicates the DVB-SI of the service... ...corresponding table is configured of a single section or a plurality of sections. For example, **TS** packets having the PID of the VCT are grouped to form a section, and sections... ...invention, the SI and/or data decoder 6010 parses an AC-3 audio descriptor, an **MPEG** 2 audio descriptor, an **MPEG** 4 audio descriptor, an AAC descriptor, an AAC+ descriptor, an HE AAC descriptor, an AAC SBR-descriptor, an **MPEG** surround descriptor, a BSAC descriptor, an **MPEG** 2 video descriptor, an **MPEG** 4 video descriptor, an H.264 descriptor, an SVC descriptor, a VC-I descriptor, and... ...and the video decoder 6005. For example, an audio-coding (AC)-3 decoding algorithm, an **MPEG**-2 audio decoding algorithm, an **MPEG**-4 audio decoding algorithm, an AAC decoding algorithm, an AAC+ decoding algorithm, an HE AAC decoding algorithm, an AAC SBR decoding algorithm, an **MPEG** surround decoding algorithm, and a BSAC decoding algorithm may be applied to the audio decoder 6004. Also, an **MPEG**-2 video decoding algorithm, an **MPEG**-4 video decoding algorithm, an H.264 decoding algorithm, an SVC decoding algorithm, and a...

13/3K/5 (Item 2 from file: 349) Links
Fulltext available through: Order File History
PCT FULLTEXT

00967977
MPEG TABLE STRUCTURE
STRUCTURE DE TABLE **MPEG**
MPEG TABLE STRUCTURE
STRUCTURE DE TABLE **MPEG**

Patent Applicant/Patent Assignee:

- **CANAL+ TECHNOLOGIES SOCIETE ANONYME**
  34, place Raoul Dautry, F-75906 Paris Cedex 15; FR; FR(Residence); FR(Nationality); (For all designated states except: US)

Patent Applicant/Inventor:

- **LEPINE Thierry**
  Canal+ Technologies Societe Anonyme, 34 Place Raoul Dautry, F-75906 Paris Cedex 15; FR; FR(Residence); FR(Nationality); (Designated only for: US)
- **CHOUTEAU Philippe**
  Canal+ Technologies Societe Anonyme, 34, place Raoul Dautry, F-75906 Paris Cedex 15; FR; FR(Residence); FR(Nationality); (Designated only for: US)
- **BURCKARD Antoine**
  Canal+ Technologies Societe Anonyme, 34, place Raoul Dautry, F-75906 Paris Cedex 15; FR; FR(Residence); FR(Nationality); (Designated only for: US)

Legal Representative:

- **COZENS Paul Dennis(et al)(agent)**
  Mathys & Squire, 100 Gray's Inn Road, London WCIX 8AL; GB;

	Country	Number	Kind	Date
Patent	WO	2002102081	A2-A3	20021219
Application	WO	2002IB3169		20020611
Priorities	EP	2001401512		20010611
	EP	2001306315		20010723

Designated States: (Protection type is "Patent" unless otherwise stated - for applications prior to 2004)
AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB,
BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model),
EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR,
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,

MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH,
PL, PT, RO, RU, SD, SE, SG, SI, SK (utility model), SK,
SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US,
UZ, VN, YU, ZA, ZM, ZW

[EP] AT; BE; CH; CY; DE; DK; ES; FI; FR; GB;
GR; IE; IT; LU; MC; NL; PT; SE; TR;

[OA] BF; BJ; CF; CG; CI; CM; GA; GN; GQ; GW;
ML; MR; NE; SN; TD; TG;

[AP] GH; GM; KE; LS; MW; MZ; SD; SL; SZ; TZ;
UG; ZM; ZW;

[EA] AM; AZ; BY; KG; KZ; MD; RU; TJ; TM;

Publication Language: English
Filing Language: English
Fulltext word count: 28048

English Abstract:

A data structure is disclosed for an **MPEG** private table section (4001404,420) including a data portion, the data structure (404) comprising a...

French Abstract:

L'invention concerne une structure de donnees destinee a une section de table **MPEG** privee comprenant une partie de donnees. La structure de donnees comprend un specificateur de taille...

Detailed Description:

MPEG Table Structure
Aspects of the present invention relate to a data structure, an **MPEG** table., and to methods relatina to the data and/or **MPEG** table, to apparatus, to apparatus for carrying out such methods, a parser, a receiver/decoder... ...computer readable medium and a signal.

Aspects of the present invention relate to a generic **MPEG** table processor for processing a
C"
transport packet stream. The invention is particularly suitable for...Standards Organisation working group "Motion Pictures Expert Group" and in particular but' not exclusively the **MPEG**-2 standard developed for digital television applications and set out in the documents ISO 13... ...context of the present patent application, the term includes all variants, modifications or developments of **MPEG** fori-nats ... aspect of the present invention, there is provided a data structure for an
I LI
MPEG private table section including a data portion, the data structure comprising a size specifier specif...particular data block, the need to provide a different structure for each use of the **MPEG** private table sec@ion can be eliminated, since a generic data structure can be defined... ...compatible, since the conventional size specifier can be retained.

It will be understood that the **MPEG** standard size specifier as referred to ab ov e specifies the @ size of the section...to a farther aspect of the invention, there is provided a data structure for an **MPEG** private table section including a data portion, the data portion comprising a plurality of data...relevant to the content of the block.

A preferred' embodiment of data structure for an **MPEG** private table comprises only one structure as described above.

An'altemative embodiment of data structure for an **MPEG** private table comprises a plutalit@7 of structures as described above.

...structure. TliesetNNTO generic structures can be used dependent upon circumstances.

The structure preferably includes an **MPEG** standard header and a further header.

Preferablv the further header includes a flag representative of aspect of the invention provides a method of assembling an **MPEG** private table, comprising,providing a data portion and adding a flag representative of a state...invention, there is provided a data structure for an MPIEG private table section, comprising an **MPEG** standard header, a further header and a
data portion,
The presence of the **MPEG** standard header can permit compatibility with existing private :table sections, whilst the presence of the...further aspect of the invention provides a method of performing a transfon- nation on an **MPEG** private table, the table comprising a data portion, the method comprising
:.n
compressing, the data... ...A further aspect of the invention provides a method of performing a transformation on an **MPEG** private table, the table comprising a data portion, the method comprising
I=
decompressing the data... decompression, encryption or decryption.

Typically said plurality of data blocks are data portions of an **MPEG** private table.

The transformed block is typically also used to forrn part of a transformed IMPEG private
I
table
Ty.

pically the **MPEG** pri-vate table comprises a plurality of table sections a h including a standard header and a data portion. and the transformed **MPEG** private table comprises a plurality oftable sections each including a standard header and a transformed... ...provided by the transformed block,
At @least a ;art of a header in the transformed **MPEG** private table may be substantially
p
:identical to a part of a standard header in the **MPEG** private table.

The method may further comprise including a value in the transformed **MPEG** private table

I
speciftring the type and/or state of transformation.

The method preferably comprises...al:header associated with each decr@pted data block.

Typically the header is a standard **MPEG** header,
A further aspect of the invention provides a compressed **MPEG** private table section and/or a compressed **MPEG** private table. Compression of the standard **MPEG** private tables saves I .

sto r!age space and bandwidth.

A further aspect of the invention provides an encrypted **MPEG** private table section and/or
I
an encrypted **MPEG** private table.

1 0
A further aspect of the invention provides an **MPEG** private table section or **MPEG** private
I
table comprising target information which identifies a receiver decoder or oup of
91'
receliver/decoders which is an intended recipient of the **MPEG** private table section.

The target inforination may directly identify a specific receiver/decoder or group...or hardware platform, A further aspect of the invention provides a method of assembling an **MPEG** private table section, the method comprising inserting target inforination which identifies a
I
rece,iver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table section.

A further aspect of the imention provides apparatus for assembling an **MPEG** private table, comprising means for providing a transformed data portion which ...forn a;transfornied block.

A further aspect of the invention provides apparatus for assembling an **MPEG** private table section, the apparatus comprising means for inser-tinor target information which identifies a receiver/decoder or group of receii,,-er/decoders which is an intended recipient of the **MPEG** private table section.

According to a further aspect of the invention, there is provided a...Preferably, the parser is adapted to parse data in a fori-nat comprising only one **MPEG** section.

Alternatively, the parser is adapted to parse data in a format comprising a plurality of
I
MPEG sections.

2) 0 Preferably, the parser is adapted to parse data ...to a further aspect of the invention, there is provided a parser for parsing an **MPEG** private table section, comprising means (for example in the form of a processor with associated memory) for parsing data in a format

comprising an **MPEG** standard header, a further header and a data portion.

Preferably, the parser is adapted to...in a format wherein the parser type field is the first field of the further **header**.

Preferably, the **parser** is adapted to parse data in a format wherein the further header
I
comprises a... ...a further aspect of the invention, there is provided a parser for parsinar an
C
MPEG private table section comprising an **MPEG** standard header and a data portion, the **MPEG** standard header including a TID extension field, comprising means (for example in the form of...According to a further aspect of the invention, there is provided apparatus for assembling an **MPEG** private table, comprising means (for example in the form of a processor with associated memory...further aspect of the invention, there is provided apparatus for performing a transformation on an **MPEG** private table, the table comprising a data portion, the apparatus comprising means (for example in...decompression, encryption or decryption.

Preferably, said plurality of data blocks are data portions of an **MPEG** private table.

Pre ferably, the apparatus further comprises means (for example in the forin of a processor wit h associated memory) for forniing a transfornied **MPEG** private table having at least one transformed data portion provided by the transformed block.

Preferably... ...form of a processor 1,vith associated memory) for including a value in the transformed **MPEG** private table specifying the type of transfon-nation.

Preferably, the apparatus further comprises means (for ...be retrieved mIore easily.

Preferably, the filter specifier is a TID extension field of an **MPEG** table section. Since many recoivler/decoders provide facilities for filterincr **MPEG** table sections according to a number of header fields, including the TID extension field, and...to a further aspect of the im7ention, there is provided a method of transmitting an **MPEG** private table, comprising performing a transformation on the **MPEG** private table using a method as described herein, and transmitting the transformed table.

A further aspect provides a method of receiving an NIPEG private table, comprising I receiving the **MPEG** private table and performing a transfori-nation on the received table usincr a method as ...identifier identifying said asset.

Preferably, the filter specifier is a TID extension field of an **MPEG** table section.

Preferably, the data portions or blocks contain key data for use by a... ...for example in the
,P
form of a processor with associated memory) for parsing an **MPEG** private table or table section as described herein, or for parsing data having a data...described herein.

A further aspect of the invention provides a transmitter adapted to transmit an **MPEG** private table or table section as described herein., or which has been processed, assembled or...the

receiver/decoder; Ficrure 7a illustrates an interrelationship between a number of components of an
MPEG stream;
Figure 7b shows how an application may be made up of modules/tables, which...1. The invention includes a mostly conventional digital television system 2 that uses the known **MPEG**-2 compression
I
system to transmit compressed digital signals. In more detail, IMPEG-2 compressor...to the end user's television set 14. The receiver/decoder 13 decodes the compressed **MPEG**-2 signal into a television signal for the television set 14. Although a separate receiver...broadcast centre. the digital video signal is first compresse6 (or bit rate reduced), using the **MPEG** -2 compressor 3. This Compressed signal is then transmitted to the multiplexer ...The scrambler generates a control word used in the scrambling process and included in the

MPEG-2 stream in the multiplexer 4. The control word is generated internally and enables the ... ...the programme.

Access criteria, indicating how the programme is commercialised, are also added to the **MPEG** stream. The programme may be comincrcialised in either one of a number of
I
"subscription... encrypted EMMs and encrypted ECMs.

The receiver/decoder receives the broadcast signal and extracts the **MPEG**-2 data stream. If a programme is scrambled, the receiiier/decoder 13 extracts the corresponding ECM from the **MPEG**-2 stream and passes the ECM to the "daughter" smartcard 4S of the end user...control If the programme is not scrambled, no ECM will have been transmitted with the **MPEG**-2 stream and the receiver/decoder 13 decompresses the data and transforms the signal into...and, PPV chain areas to the multiplexer and scrambler 4, and hence to feed the **MPEG** stream with EMMs. If other riahts are to be granted, such as Pay Per File... not tied to a particular real-time operating system (RTOS) or to a particular processor.

MPEG Systerns
Conventional dicrital television broadcast systems ...processor in the forrn of what is conventionally known as a packetised 'elementary stream or **PES**. This continuous flux of data, which is formed by assembling the bodies of the transport packets, itself comprises a sequence of packets, each **PES** packet comprising a packet header and body.

Other data not requiring immediate processing may also be encapsulated within the bodies of the transport packets. Unlike **PES** data, which is treated immediately by a processor to generate a real time output, this ... ...the section or table includincr a table ID or TID.

Vanous aspects of a conventional **MPEG** datastreann will now be described with reference to Figures 7a, 7b and 7c which are...of which is incorporated herein by reference.

Referring to Figure 7a, as is known, the **MPEG**-2 bitstreann includes a programme access table ("PAT") 3 1 0 having a packet identification... ...reference to the PIDs of the streams of the audio NIPEG tables 314 and video **MPEG** tables 316 for that programme. A. packet having a PID of zero, that is the progranune access table 3 10, provides the entry point for all **MPEG** access.

In order to download applications and data for them, two new stream qTes are... ...1
the@ relevant PMT also contains reference to the PIDs of the streams of application **MPEG** tables 3 1 8 (or sections of them) and data NIPEG tables 320 (or sections... ...an application 322, the application is divided
9
into modules 324 each fornied bv an **MPEG** table, some of which are made up by a single section 3 18 , and others...328, but different respective TID extensions.

For each application 322, there is a single such **MPEG** table 324 which is used as a directory, and which is shown in greater detail...which is transmitted has a respective predetermined TID 328. To download an ap lication, the **MPEG** table having the appropriate TID and a TID extension of zero is
p
downloaded to... decreasing or at least better managing the information broadcast will be investigated presently.

A private **MPEG** table section is shown below in Table 1. This format is used uniquely to put raw data into **MPEG** sections. The maximum number of sections is dependent upon the section svntax indicator.

TABLE I...as a generic data structure in Figure 8.

5 The data structure comprises a conventional **MPEG** private table section header 400.

The table-id-extension field 402 of the conventional header...conventional CRC information 420 is retained.

The raw data portion (6r body) of the standard **MPEG** private data section is replaced by further header 404 conaprisincy additional: header fields, plus a...1, compatibility with the existing
i=
structure is':maintained. This also gives compatibility with existing **MPEG** table handling hardware and software.

The private table sections will usually be generated at the... ...and broadcast to receiver/decoders. A receiver/decoder may then retrieve the inforniation from the **MPEG** stream and recreate the data structures in its memory before passing them to a parser... ...The binary data format is given using the ri-memonics
I 1@
defined in the **MPEG** standard,
TABLE2
Na m e Size (bits) Format Default
value
Long
Private
C+-section(
Table...comprising a parser provides a layer of abstraction between the application layer 508 and the **MPEG** table reception and filtering layer 504, which extracts information sent by the

broadcast system 500...are not compressed, so that the compressed' table may be processed and transmitted usincr standard **MPEG** hard- and software, and so that the receiver may determine whether a table has been... ...which algoiithm was used to'compress it. Only the body (or data portion) of the **MPEG** private table is compressed. In other examples, everything between (but excluding) the corn ression-related...len@ths, is then compressed to give a new, compressed, data block. A new private **MPEG** table is then created from this block by splitting it into a number of seg... ...Apart from these flags and the fields
I
relatincr to section numbers and sizes, the **MPEG** standard and further headers otherwise remain the same as in the original table. The compressed...to Figures I IA and I I B.

Referring first to Figure I IA, private **MPEG** Table 700 comprises N private table sections 702 through to 704. Each table section comprises a standard **MPEG** private table section header A, a further header B, a body Cl to Cn, and...using any suitable compression algorithm. This results
i ZI
in compressed block 708.

A compressed **MPEG** private table 7 1 0 is then produced from compressed block 708 ill the following... ...then be transmitted or stored. The compressed table is corn atible not onlyN@7ith the **MPEG** standard private table, but ...into its original constituents, namely section bodies CI to Cn, and the original, uncompressed private **MPEG** table 720 having table sections 722 to 724 is reconstructed from these section bodies.

The... the applications, and, to a lar e extent if not wholly, the parser. Since the **MPEG** standard header remains unchanged
9 I
in the compressed and/or encrypted table and the standard **MPEG** private table section
I
stru cture is therefore retained, compression/encryption is also transparent to the lower-level MP EG compliant modules concerned Nvith transmission, reception and filtering of **MPEG** tables. At the receiver/decoder, compressed and/or encrypted tables are ...maintained.

The compression / encryption technique has here been described in the context of the genIeric **MPEG** private table structure discussed previously and exemplified in Tables 2 and 3. Hlowever, it is also applicable to standard **MPEG** private tables, which may be compressed and encrypted using the same technique. In some such...section bodies. The technique is@also applicable to other similar data structures which are not **MPEG** private tables.

Application Examples
The embodiments described above may be used in a number of...to analyse and use the data pointed to by the memorized entry
point (ON ID, **TS** Id, SV ID and association tag).

The format of the downloaded data can be any...This metadata
C
comes from the Content Provider (in)KAIL format) and is put into **MPEG** private sections.

Those sections sent to the STB are broadcast in a carousel mode.

There...the tables relating to a required category of assets to be extracted easily from the **MPEG** stream through hardware filtening, The user may, for example, request to see a list of...the relevant asset information.

I 0 The possible available categories are also transmitted in another **MPEG** private data table.

The list of available assets constitutes a prograin catalogue. Further tables are...including a respective one of such further size specifiers.

3 . A data structure for an **MPEG** private table section including a data portion, the data portion comprising a plurality of data...as claimed in any of claims I to 122.

14. A data structure for an **MPEG** private table, comprising a plurality of structures as claimed in any of chairns 1 to 12.

15. A data structure for an --IvIPEG piivate table section, comprising an **MPEG** standard header, a further header and a data portion,
16. A structure accordinty to claim...0
A structure according to claim 24 or 25 wherein the header is a standard **MPEG** header.

27. A compressed **MPEG** private table section.

1 5
28. A compressed **MPEG** private table, comprising at least one compressed **MPEG** private table section as clairned in claim 27.

29. A compressed **MPEG** private table,
30. An encrypted **MPEG** private table section.

-pted **MPEG**
3 1. An encrypted NIPEG private table, comprising at least one encry private table section as claimed in claim 30,
32. An encrypted **MPEG** private table.

3 3. An **MPEG** private table section comprising target information which identifies a receiver/decoder or group of receiver/decoders which is an intended recipient of the NIPEG private table section.

34. An **MPEG** private table, comprising at least one **MPEG** private table section as claimed in claim 33.

35. An NPEG ...a
receiver/decoder or group of receiver/decoders which is an intended recipient of the **MPEG** private table.

Ss
36. An NIPEG private table or private table section according to any...

Claims:

38 A method of assembling an **MPEG** private table, comprising providing a
data portion and adding a flag representative of a state... ...been subject to a transfon-nation.
40 A method of performing a transformation on an **MPEG** private table, the
table comprising a data portion, the method comprising compressing,C -@Tting or...clairns
43 to 55 wherein said plurality of data blocks are data portions of an **MPEG** private table.(
57 ...accordina to any of claims 43 to 56, further comprising forming a
C" zntransformed **MPEG** private table having at least one transformed dataportion provided
by the transformed block.
58 A method accordincy to claim '56 and 57 wherein the **MPEG** private table comprises a
plurality of table sections each including a standard header and

a data portion, and tile transformed **MPEG** private table comprises a-ndard header and
aplurality of table sections each including a...transformed NIPEG private table is
substantially identical to a part of aheader in the **MPEG** private table,1 5
60 A method according to claim 57,5S or 59, further... ...of claims 57 to 60, further
comprising including
cl Ca value in the transformed **MPEG** private table specifying tile state oftransformation of
the transformed data portion.
62 A method of transmitting an NIPEG private table., comprising performing a
transformation on the **MPEG** private table using a method according to anyof claims 56 to
61, and transmitting the transformed table,
63 A method of receiving an IMPEG private table, comprising receiving tile
MPEG private table and performing a transformation on the received tableusing a method
according to... claim 66 or 67, wherein the filter specifier is a TID extension field of an
MPEG table section.1 5
69 A method according to any of claims 37 to 68 which is an intended recipient.

71 A method of assembling an **MPEG** private table section, the method
comprising inserting target inforination @Aiich identifies a receiver/decoder4@or group of
receiver/decoders which is an intended recipient of the **MPEG**private table section.
72 Apparatus for assembling an **MPEG** private table, comprising means (for
instance in the form of a processor with associated memory 73 Apparatus for performing a
transformation on an **MPEG** private table, thetable comprising a data portion, the apparatus
comprising means (forinstance in...block, so as to form atransformed block.I O
75 Apparatus for assembling an **MPEG** private table section, the apparatus
comprising means (for instance in the fon-n of a... ...decoder or group of receiver/decoders
which is an intended1 5 recipient of the **MPEG** prj@7ate table section,
76 A parser comprising means (for example in the forrn of a processor with
associated memory) for parsing an **MPEG** private table or table sectionaccordincr to an y of
claims ...to any of claims 3 7 to 7 1.
77 A parser for parsing an **MPEG** private table section comprising an **MPEG**
2 5 standard header and a data portion, the **MPEG** standard header including aTID extension

field, comprising means (for example in the form of parser for parsing an **MPEG** private table section including a data portion, comprising ineans (for example in the form of ...including a respective one of such further size specifiers,SO, A parser for parsing an **MPEG** private table section including a data portion,the data portion comprising a pluralif,@y of...such block includes a tacr representative of its content.
91 A parser for parsing an **MPEG** private table section, comprising means (for I 0 example in the foirn of a processor with associated memory) for parsing data in a format comprising an **MPEG** standard header, a further header and a data portion. 9 2. A parser according to...in a format wherein the parser type field is the first field of the further **header**.

96 A **parser** according to any of claims 91 to 95, wherein the means is further adapted to...structure as claimed in any of claims I to 36.
99 Apparatus for assembling an **MPEG** private table, comprising means (for example in the form of a processor with associated memory) ...Nvhich has been subject to a transformation.101. Apparatus for performing a transformation on an **MPEG** privatetable, the table comprising a data portion, the apparatus comprising means(for example in...claims 104 to 116, wherein saidplurality of data blocks are data portions of an **MPEG** private table. 1 is. Apparatus according to any of claims 104 to 1 17, further... ...for example in the form of a processor with associated memory) for formincr a transformed **MPEG** private table having at least one transformed4@data portion provided by the transformed block... ...the form of a processor with associated memory) for including avalue in the transformed **MPEG** private table specifying the type oftransformation.Apparatus according to claim 1 1 8 or ...the form of a processor with associated memory) for includincy a value in the transformed **MPEG** private table specifying the state of transformation of the transformed data portion.121. A receiver...I to 26.5 126. A receiver/decoder adapted to receive and/or decode an **MPEG**private table or table section according to any of claims 27 to 36, orwhich has... ...claimed in any of claims 1 to 26.129. A transmitter adapted to transmit an **MPEG** private table or tablesection according to

13/3K/6 (Item 3 from file: 349) Links
Fulltext available through: Order File History
PCT FULLTEXT

00751240
MEMORY MANAGEMENT METHOD FOR HIGH SPEED STREAMING DATA PROCESSING IN A COMPUTER DEVICE
GESTION ET MANIPULATION OPTIMALES DE SUPPORT D'EMISSION EN CONTINU A GRANDE VITESSE DANS UN DISPOSITIF INFORMATIQUE

Patent Applicant/Patent Assignee:

- **RAVISENT TECHNOLOGIES INC**
  1 Great Valley Parkway, Malvern, PA 19355-1308; US; US(Residence); US(Nationality)

Inventor(s):

- **WOLFF Robert M**
  378 Sunnyslope Drive, Fremont, CA 94536; US
- **LANGER Randy**
  3785 Celeste Court S.E., Port Orchard, WA 98366; US
- **SIGMUND Ulrich**
  Viktorlastr. 6, D-76133 Karsruhl; DE

Legal Representative:

- **GLENN Michael A(et al)(agent)**
  Law Offices of Michael A. Glenn, 3475 Edison Way, Ste. L, Menlo Park, CA 94025; US;

	Country	Number	Kind	Date
Patent	WO	200064186	A2-A3	20001026
Application	WO	2000US8771		20000331
Priorities	US	99283947		19990401
	US	99287535		19990406
	US	99342527		19990629
	US	99467552		19991210

Designated States: (Protection type is "Patent" unless otherwise stated - for applications prior to 2004)
AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY,
CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN,
IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MD, MG, MK, MN, MW, MX,
NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI,
SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN,
YU, ZA, ZW

[EP] AT; BE; CH; CY; DE; DK; ES; FI; FR; GB; GR; IE; IT; LU; MC; NL; PT; SE;

[OA] BF; BJ; CF; CG; CI; CM; GA; GN; GW; ML; MR; NE; SN; TD; TG;

[AP] GH; GM; KE; LS; MW; SD; SL; SZ; TZ; UG; ZW;

[EA] AM; AZ; BY; KG; KZ; MD; RU; TJ; TM;

Publication Language: English
Filing Language: English
Fulltext word count: 26922

English Abstract:

...allocation and deallocations of objects which occur. A word wise search is performed on an **MPEG**-2 stream. A pre-parser is used to create a secondary datastream to parallel a...

French Abstract:

...desaffectations d'objets qui surviennent. Une recherche par mot judicieuse est effectuee sur un flux **MPEG**-2. On utilise un pre-analyseur pour creer un flux de donnees secondaire parallele a un flux de donnees **MPEG**-2 lors du decodage et du rendu. Le flux de donnees secondaire parallele decrit la structure du flux de donnees **MPEG**-2 d'une maniere efficace et pratique et permet d'eliminer la duplication de la... ...de decodage. Une prediction de mouvement a deux etapes pour le cas D d'interpolation **MPEG**-2 produira des artefacts visuels si elle n'est pas corrigee.

Detailed Description:

...scanning a real-time stream of data to locate a start-code-prefix in an **MPEG**-2 data stream, and streams that use the exact same start-code paradigm. The same... ...and digital data compression, and more specifically to preventing rounding errors that can accumulate in **MPEG**-2 type decompression.

DESCRIPTION OF THE PRIOR ART
The transfer of information in the form... ...in real time, as a continuous and uninterrupted stream using such formats as MPEG2. While **MPEG**-2 has been used in static media such as DVD and is well known to the general public, it is less known that **MPEG**-2 has been used in streaming (real-time) applications such as digital satellite broadcast. e...algorithm to insure that audio start code synchronization is maintained during scanner operation on an **MPEG**-lconforming audio channel. This problem does not exist for confonnant **MPEG**-2 video and audio channels. In fact, it is guaranteed in the **MPEG**-2 specification that this can never occur.

There are two approaches that have been used in the art to address the issue of **MPEG**-2 start code scanning.

* A serial read of the incoming bytes looking for a OxOO OxOO OxOl pattern. This

approach is processor intensive.

Reading the **MPEG**-2 data into a buffer, and then examining every third byte to see if it... ...or transmitted, and then decompressing it back to original format when downloading or receiving it. **MPEG**, which is an
acronym for "Motion Picture Experts Group", has evolved as a principle
international... ...Microsoft's Windows
operating system. This gave users their first taste of the possibilities of **MPEG** and laid the foundation for greater heights of multimedia. The advent of the MPEG2 standard... ...delivers full 30 frames-per-second TV-like video and CD
1 5 quality audio. **MPEG** I penetrates numerous markets where VHS quality video
is acceptable, achieving acceptance in education and... ...programs,
interactive encyclopedias and action games that enhance learning and playing.

In the Far East, **MPEG** I fuels rich video and audio playback in VideoCD and Karaoke players. **MPEG** I has made its way onto corporate intranets, the new
private networks that connect employees... ...functionality, the average personal computer is transformed into a full featured home entertainment theater.

The **MPEG** committee began in late 1988 with the immediate goal of
standardizing video and audio for ...two channels of sound.

MPEG2 introduces a scheme to decorrelate multichannel discrete surroundsound audio.

The **MPEG** video syntax uses a few tokens to represent an entire block of sixtyfour samples. **MPEG** also describes a decoding, or reconstruction process where the coded bits are mapped from a... ...a "DCT" algorithm, or with a prediction algorithm. The decoding process algorithms are defined by **MPEG**. The syntax can exploit common video characteristics such as spatial redundancy, temporal redundancy, uniform motion...

Claims:

...high ratios often include oversampling factors in the source video. The coded sample rate an **MPEG** image sequence is usually not much larger than thirty times the specified bit rate. Subsampling... ...of the high compression ratios for all video coding methods. including those of the non-**MPEG** variety.
6MPEGI and MPEG2 video syntax are useful over wide ranges of bit rates... ...picture. Display picture 1 5 size is the same as the coded picture size In **MPEG**. the display picture size and frame rate may differ from the size (resolution) and frame... ...fundamental phases, Source Rate. Coded Rate, and Display Rate, maydiffer by several parameters. The **MPEG** syntax can separately describe Codedand Display Rates through sequence-headers, but the Source Rate...minimize the total number of bits needed. Similarly to JPEG, the Motion Pictures Experts Group (**MPEG**) has promulgated two standards for coding image sequences. The standards are known as **MPEG**-I and**MPEG** The **MPEG** algorithms exploit the common fact of relatively smallvariations from frame to frame. In the **MPEG** standards. a full image is compressed and transmitted only once for every twelve frames. A... ...for the particular block. Motion detection can be used in some of the predictor algorithms. **MPEG** I is described in detail in International Standards Organization (ISO) CD 1 1 172. Accordingly,

for compression of video sequences, the **MPEG** technique is one which treats the compression of reference frames substantially independently from the compression... ...at the expense of requiring extensive computations either on compression or decompression, or both.The **MPEG**-2 video compression standard is defined in ISO/IEC 13818-2"Information technology--Generic coding of moving pictures and associated audio information: Video". **MPEG**-2 uses motion compensation on fixed sized rectangular blocks of pixel elements ("macroblocks") to use... ...boundaries, and so requires an interpolation of pixel elements.Such interpolation is specified in the **MPEG**-2 standard, as follows:1 1case-A:if ((!half flag[O])&&(!half flag[l...The "//" operator at the ends of cases B, C, and D is defined in the **MPEG** -2 specification as: "Integer division with rounding to the nearest integer. Half-integer values are... ...short-cut solution is that it causes artifacts because rounding is handled different than the **MPEG** standard dictates. So to have artifact-free implementations, the short-cut solution is prohibited. The... ...one least-significant-bit for first-generation compensation, and is not a problem. But the **MPEG**-2) standard allows for multigeneration compensation. The consequence of this is that a predicted picture... sample and a corresponding descriptor array. Fig. 9 is a functional block diagram of an **MPEG**-2 video decoding processor; and Fig. 10 is a functional block diagram of an **MPEG**-2 video decoder embodiment of the invention that includes dual-step half-pixel prediction.DETAILED...following discussion describes a presently preferred architectural approach for handling ISO 13818-1 (See www. **mpeg**.org, www.ansi.org (ISO 13818-1)) transport streams in software and for translating these transport streams into various formats of **MPEG** streams according to the invention. This embodiment of the invention finds application in the area... ...an input, i.e. the DVB transport stream and translate these packets into other useful **MPEG** formats at the user's request. The minicore also provides timestamp and clock reference information... ...video data streams on the output interfaces.The transport minicore provides on its output interfaces: **PES** 51 with zero-length **PES** headers in the case of DVB video PIDs. Length-enriched **PES** 52, reconstituted to contain length fields for all **PES** packets regardless of input payload length and 64k/l 6bit length field limitations. Elementary stream... ...p-ancillarystart = NULL;25p ancillary cur= NULL;nurn-ancillary = 0;tp = NULL;index = 0;**PES**length = 0;scramblingcontrol = 0;data -alignment-indicator 0;PTS-DTS-flags = 0;PTS 0... index+3]>Oxbc);// Mark down where we are as we'll want to "backup" in **PES** situationsafter parsing is complete.p-ternp-tp = tp + index;ParsePESHeader(;assert(scrambling-control==OxOO... ...beginning of the ESpayload.*ppayload len = TRANSPORT SIZE - index;return tp + index;case **PES**:**PES** or LengthRichPESif LengthRichPES, we need to "tag" this REAL header forlater use with34// the length enriching game.HH If it is just **PES**, then use the pre-parsing tp pointer tocalculate length and start.*ppayload len = TRANSPORT SIZE - (p tempJp ppacket);return pternp@tp;case **TS**:break;1 0 default:assert(FALSE);return NULL;1 5 elseswitch(out-type)case ES:case **PES**:case LengthRichPES:// Payload is just payload of **PES**.*ppayload-len = TRANSPORT-SIZE - index;return tp + index;case **TS** :*ppayload-len TRANSPORT-SIZE;return ppacket;default:assert(FALSE);return NULL;assert(FALSE... ...ESCR-flag, ES-rateflag, DSM-trick-mode-flag;unsigned char addcopy-infoflag, **PES**CRCflag, **PES** -extensionsflag;unsigned char* ppayload -start-actual;int **PES**-header-length;dw-tmp = (tp[index]<<l6) I (tp[index+l]<<8) tp[index+2... ...tmp<=Oxef);break;case AudioTS:assert(tmp>=OxcO && tmp<=Oxdf);break,default:assert(FALSE);break;**PES**length = (tp[index++]<<8) I tp[index++],H Begin bit-parsingassert((tp[index] & OxcO... ...MO;DSM trick mode flag = tp[index] & 008;add-copyinfoflag = tp[index] & OxO4;**PES**-CRC-flag = tp[index] & OxO2; **PES**-extensions-flag = tp[index++] & OxO I;// **PES** header

length next.**PES**-header-length = tp[index++];assert(**PES** header ...Now save off our current position for later calculations.ppayloadstart-actual = tp + index + **PES** -header-length;if (dataalignment-indicator)fif (intype==VideoTS && ppayloadstart - actual... ...the// "find" will not get recorded if we are inbLookingForSync mode.SYNC-index = index+**PES** -header-length;MakeAncillary(aVidSEQ, index+**PES** -header-length,M3);if (intype==AudioTS)if (ppayload-start-actua1[0]==0xff &&(p... ...39"find" will not get recorded if we are inbLookingForSync mode.SYNC index = index+**PES** header length;MakeAncillary(aAudFrameStart,index+

PES-header -length, Oxfff);**Parse** PTS and/or DTS.1 0 if (PTSDTSflags & OxO2)PTS only 00 IO... ...H ESCRH ES-rate1 0 H DSM-trick-modeH additionalcopyinfo**PES** -CRC**PES**-extensions f a bunch inside here Istuffing bytes1 5 Since we dont care... ...index = ppayload-start-actual - tp;return;DWORDLONG CDataBlock::ParseTS-40(unsigned char checkbits)DWORDLONG **TS**, **TS** = 0;H Check marker bits in first byte.H PTS only 00 I 0 [-3 ... ...index+2] & OxOl) != OxOI 11 (tp[index+4] & OxOl) OxOl)41assert(FALSE);return 0:**TS** = (tp[index] & OxO8) >> 3; H 33rd bit.**TS** = (**TS** << 1) (tp[index++] & OxO6) >> 1;**TS** = (**TS** << 8) tp[index++];**TS** = (**TS** << 7) ((tp[index++] & Oxfe) >> 1);**TS** = (**TS** << 8) tp[index++]; **TS** = (**TS** << 7) (tp[index++] & We) >> 1);if (**TS**==O) H In the zero case, we'll make itIinstead. This solvesthe problem of**TS**= 1; inserting a zero-pts value into the ring which is ato non-pts" in our book.return **TS**;5 1void CDataBlock::MakeAncillary(QIAncillaryType atype, unsigned int at-index,DWORDLONG at-value... ...scanning for synchronization points.if (bLookingForSync && SYNC-index==-I)return:switch(out-type)Icase **TS**:ad.alndex = (int)(pcurout-pdataout) + at index: // Calculate anindex based on beginning of data-out.break-,42case **PES** :assert(FALSE);break;case LengthRichPES:assert(FALSE);break;case ES:switch (atype)0 Henum QI... ...since in all of these cases, indexis an offset into// the transport header or **PES** header (which follows thetransport header) and inES mode. both the **PES** header and transport header will beremoved. So, thefinal index should point to the...packet. unsigned char* tp; Transport packet being scanned.unsigned char prevcont;1 5 H **PES** header entriesunsigned int **PES**length;unsigned char scramblingcontrol;unsigned char data-alignment-indicator;unsigned char PTS-DTSflags... ...QI-NOWINDOW 129enum QllnputStreamType f InvalidMinIT, VideoTS, AudioTS. InvalidMaxITI;enum. QIOutputStreamType @InvalidMinOT, **TS**, **PES**. LengthRichPES, ES,InvalidMaxOTIf;enum. QI AncillaryType I Inva1idMinAT. aPTS, aDTS, aPCRb, aPCRx, aESCR,aPESHeader, aVidSEQ...a sync initially. (at least in ES mode)if (outtype==ES 11 out-type==**PES** 11 out-type==LengthRichPES)setReSync(;assert(outjype==ES 11 out-type== **PES**); H Only supporting elementarystreams at this point.54// Do *NOT* initialize the input buffer...ecx at end of buffer?jz exitRoutine5H Bob W. pointed out that some **MPEG** versions usedH zeros for stuffing bytes. Since we don't wantH to examine... ...eax,buf convert to buffer offsetadd eax,eax do the high bit set on **PES**// header trickxchg esi,edixor dl,OCOhcmp dl,030hrcr eax, 1stosd... ...benchmark example of the performance achieved using the invention, a 20 megabyte capture of a **MPEG**-2 stream was processed. Using the invention, a text file describing more than twenty-thousand... ...4 This run time wasachieved on second and subsequent runs when the 20 megabyte **MPEG**-2 file was already loaded into the disk cache. In its first actual application, the...most or all of it for them. The second-stage filter 122 outputs a modified **MPEG**-2 datastream 124 and an updated secondary channel 126 to a final stage filter, e...Fig. 8 illustrates a typical MPEG2 video datastream sample which includes payload, ES-headers, and **PES**-headers all head-to-toe in a single datastream.

If there were no pre-parsing... ...the descriptor table is sequentially scanned and functions as an address register. For example, a **PES** header will have "Ox8400" in the top seven bits of its descriptor. The lengths of... ...the sample features can be added while looking for other feature descriptors. In Fig.
8 **PES**-headers exist at offsets Ox284 (Ox2O + Ox4 + Ox2 IA + Ox4 + Ox42), and also at OxI664... ...The length of each feature can be quickly determined. Fig. 8 indicates that both the **PES**-headers are of equal length (OxIC), but this is not always the case. If the... ...trying to evaluate the MPEG2 sample datastrearn directly. ISO/lEC Specification 13818-1 allows for **PES**-headers to be inserted within other feature types. Embodiments of the present invention only allow such insertions for
86basic-payload features. So **PES** -headers be relocated to one side or the other of any feature they invade. When this happens, the content of the **PES**-headers must be adjusted slightly to compensate for the change in absolute location within the MPEG2 datastream. Fig. 9 is a functional block diagram of an **MPEG**-2 video decoding processor 100.An incoming **MPEG**-2 datastream 101 is received by a **header parser** 102 fordecompression. The local spatial decorrelation methods in **MPEG** and JPEG are very 0 similar. Picture data is block transform coded with the two... ...the run-length symbols are variable length coded using a canonical (JPEG) or modified Huffman (**MPEG**)scheme. Global frame redundancy is reduced by I -D DPCM, of the block DCcoefficients. followed by quantization and variable length entropy coding. The **header parser** I 1 02 separates a motion vector information stream I 1 03 from a compressed **MPEG**-2 video bit stream I 1 04. A motion vector (MV) calculator 1 1 06... ...stored to be used later by the predictor 1120. The sub-routines listed herein for **MPEG**-28799jojuj3poop soiqduii? jxe ;)qi JO ;)Ims ic ui ijun Ouipuolq -eqdlu oldwis... ...ILL80/OOSfl/JLJd 98IV9/00 OAALIn Figure 10, a two-step motion prediction for **MPEG**-2 interpolation case-D yields visual artifacts if not corrected. The invention is placed into...output frames are statistically correct images. The decoder 1200 implementation in Fig. 10 receives an **MPEG**-2 datastrearn 1202 with a **header parser** 1204. The **header parser** 1204 separates a motion vector information stream 1206 from a compressed **MPEG**-2 video bit stream 1208. A motion vector (MV) calculator 121 0 produces a vertical... ...used which can take advantage of the"pavgusb" instruction in some commercial microprocessors when the **MPEG**-2interpolation case-D is encountered. Specifically, case-D is,case-D:if (half flag...length and type characterizations included in said second descriptor array.
41 A method for decompressing **MPEG**-2 datastreams, comprising:
separating an **MPEG**-2 datastream into a motion vector datastream anda coefficients datastream,102co@:UIQ.IQT4M... ...term for a set of predicted pixels calculated by a two-step predictor.
46 An **MPEG**-2 decoder, comprising:
a **header parser** for separating an **MPEG**-2 datastream into a motionvector datastream and a coefficients datastream;a motion vector calculator...by rounding errors that occur in the two-step half-pixel prediction processor.
47 The **MPEG**-2 decoder of claim 46, wherein:
104the logic unit is such that if both... ...is added to said DC coefficient, otherwise a constant of zero is added.
48 The **MPEG**-2 decoder of either of claims 46 or 47, wherein:
the logic unit is such... ...C, CIIVT p k/Tcvr pLAq3 Y)-N2 15C;Video **PES**Len-enriched Video **PES**Video TransportISO 13818-1 Transport Video elementary streamcompatible - 4@,*Handier @53transport AN PTS/DTS/PCR clock infoinput stream Audio Transport MiniCoreAudio **PES**Audio elementary stream3 15t-0347-
030602D4029D@@027C022BOlE2OlC60141... ...OxOO20ES Header Ox4 Ox8204PaVload

Ox2IA OxO21AES Header Ox4 Ox8204Payload Ox42 OxO042**PES** Header OxIC Ox841CPavload Ox7OD OxO7ODMPEG2 ES Header Ox4 Ox8204Payload Ox39 OxOO39samples ES Header Ox4 Ox8204Pavload OxC76 OxOC76**PES** Header Ox1 C Ox841CPayload Ox641 OxO641ES Header OA Ox8204Pavload OX8 OxOO08ES... ...OxOBF2UTF2,(4ES Header x Ox8204ad OxB8 OX00B13 15Figuliloo101 **Header** 4102**Parser**)103 104Mv VLD 008Calc RLDI I FOF1.631 1 0... ...Predict 122--II 28 24@1 26Frame Store14 / 15Fig. $0)200202 **Header** A204**Parser**12M 208)212h,1210@ MV ho VLD @-1228Calc RLDla222 123 FO...

13/3K/7 (Item 4 from file: 349) Links
Fulltext available through: Order File History
PCT FULLTEXT

00749102
METHOD FOR GENERATING AND PROCESSING TRANSITION STREAMS
PROCEDE PERMETTANT DE GENERER ET DE TRAITER DES FLUX DE TRANSITION

Patent Applicant/Patent Assignee:

- **SARNOFF CORPORATION**
  201 Washington Road, CN5300, Princeton, NY 08543-5300; US; US(Residence); US(Nationality)

Inventor(s):

- **WARD Christopher**
  144 Essex Avenue, Glen Ridge, NJ 07028; US
- **HURST Robert Norman**
  68 Hart Avenue, Hopewell, NJ 08525; US

Legal Representative:

- **NEY Andrew L**
  Ratner & Prestia, 301 One Westlakes (Berwyn), P.O. Box 980, Valley Forge, PA 19482-0980; US;

	Country	Number	Kind	Date
Patent	WO	200062552	A2	20001019
Application	WO	2000US10208		20000414
Priorities	US	99129275		19990414
	US	99347213		19990702
	US	99430631		19991029

Designated States: (Protection type is "Patent" unless otherwise stated - for applications prior to 2004)
CA, JP, KR

[EP] AT; BE; CH; CY; DE; DK; ES; FI; FR; GB; GR; IE; IT; LU; MC; NL; PT; SE;

Publication Language: English
Filing Language: English
Fulltext word count: 15220

Detailed Description:

...that the available bandwidth is used more efficiently. For example, the Moving Pictures Experts Group (**MPEG**) has promulgated several standards relating to digital data delivery systems.

The first, known as **MPEG**- I refers to ISO/IEC standards I 1 172 and is incorporated herein by reference. The second, known as **MPEG**-2, refers to ISO/IEC standards 13818 and is incorporated herein by reference. A compressed... ...or B-frame encoding). "Seamless splice" means a splice which results in a continuous, valid **MPEG** stream. Thus, a frame accurate seamless splicer will preserve an exact number of frames when... ...at great expense.

In an improved method allowing seamless splicing at the transport stream level, **MPEG** and **MPEG**-like information streams including, e.g., video information may be spliced together in a relatively... ...entry and exit points.

For example, a packet containing a video sequence header in an **MPEG**-like video stream comprises an appropriate in-point. An **MPEG**-like information stream that contains such inpoints and out-points is said to be spliceable... ...has proposed a stand ard SMPTE 312M defining such splicing points entitled "Splice Points for **MPEG**-2 Transport Streams," which is incorporated herein by reference in its entirety.

Unfortunately, the placement... ...be desirable to provide a method and apparatus that allows seamless, frame accurate splicing of **MPEG**-like transport streams. Moreover, it is seen to be desirable to provide a method and...system in which a need exists to perform seamless, frame accurate splicing of, e.g., **MPEG**-like transport streams including video sub-streams.

An embodiment of the invention will be described... ...server and spliced together in a seamless, frame accurate manner to produce, e.g., an **MPEG**-2 compliant video stream suitable for transporting to a far end decoder. However, since the... ...insertion of local commercials and trailers for digital cinema, frame accurate Internet-based streaming of **MPEG**-2 transport streams and limited production facilities (i.e., those production facilities performing only the... ...The mass storage device 1 1 5 is used to store a plurality of, illustratively, **MPEG**-2 transport streams including encoded video sub-streams and associated audio streams providing a program...2A graphically depicts a frame accurate, seamless splicing operation of two 30 frames per second **MPEG**-2 transport stream clips (210, 220) using a transition clip (230) to produce a resulting spliced 30 frames per second **MPEG**-2 transport stream clip (240). The transition stream 230 is formed using portions of the...detail. Two types of information are used to build a transition clip, frame data and **MPEG** data. Frame data comprises information such as the location, coding type and presentation order of... ...from-stream and the to-stream are to be recoded to produce the transition clip. **MPEG** data comprises information such as frame dimensions, bit rate, frame versus field formats, video buffering verifier (VBV) delay, chrominance sampling formats and the like. **MPEG** data is used to specify the **MPEG** encoding characteristics of the transport stream. The transition clip is preferably encoded or recoded using the same **MPEG** parameters as the input **TS**.

To assist in the generation of transition clip(s) by the transition clip generation function... ...the per-frame data, the index generation function 342 optionally saves all fields for common **MPEG**-2 structures such as sequence headers, picture headers and the like.

Thus, the stream library...no need to parse transport streams at the time of splicing to determine frame and **MPEG** parameters of the streams. In addition, the play to air server 1 1 0 optionally... ...is, the information stream to be indexed is parsed down to the packetized elementary stream (**PES**) layer to examine the first video frame of the video elementary stream included within the... ...calculated buffer delay. The indexer calculates this value as indicated in Annex C of the **MPEG**-2 specification. The buffer delay Bd and calculated buffer CBd should match, but if the...and the number of frames to be copied.

In addition, since the indexing library retrieves **MPEG** fields as it parses a transport stream, all required recoding parameters are also saved during...frame dependencies (i.e., a "self contained" clip), the invention is capable of producing an **MPEG** compliant transition clip including such frame dependencies.

B. Decoding.

The second step in the process... ...must begin at an I-frame. As an artifact of the use of prediction in **MPEG** encoding, every non frame is ultimately dependent on the previous I-frame. The above-described... ...to baseband, they are recoded into a VES. The inventors used a Samoff Corporation DTV/**MPEG**-2 Software Encoder to ensure high overall performance, picture quality and modularity. The rate control the encoder was updated to support the output file format of the decoder.

The **MPEG** encoding parameters that were parsed from the transport stream during frame selection are passed to... ...VES. Pending restamping of temporal-reference fields, the resulting transition clip comprises a syntactically complete **MPEG**-2 stream (except that is does not have a sequence-end-code) and contains all... ...for each frame in the transition stream.

It should be noted that according to the **MPEG**-2 standard, temporal discontinuities within a transport stream are allowed. However, since some decoders are not entirely compliant with the **MPEG**-2 standard, such allowed temporal discontinuities within a transport stream result in improper decoder operation... ...by the use of the re-stamping process.

Using the output of the restamping process, **PES** headers are generated and the frames are output into a **PES** stream. The location of each **PES** header and the size of each **PES** packet are recorded during this process. Finally, transport packets are generated to hold the **PES** packets. Each layer of packets adds overhead to the **TS** resulting in a slight size increase. The packets in the resulting **TS** are stamped with the PID of the video stream being spliced. The final output of the packetizing process is a **TS** containing a single VES.

The stream does not contain any program specific information (PSI).

E...stream comprising video information suitable for use in providing a seamless splice of, illustratively, an **MPEG**-2 transport stream including a video stream or substream. It will be appreciated by those... ...be noted that each of streams A (410), B (420), and T (430) are, illustratively, **MPEG**-s transport streams comprising video frames (not shown), meta-data, data essence and audio data...

Claims:

...AND FOLLOWING I-FRAME TO TRANSITION CLIP
FIGm 905 1010-P1010tr: SEQ. **HEADER**1000 **PARSETRANSPORTI**. : PICTURE-HEADER:(SI/SO)SMPGE1015EXAMINE FRAME r 1020-D020 tr: **pes**: fr:DETERMINE INDEX DATA FOR FRAME .4 :pT DT. Bd:CBd: (I/O)VBV:(SI...

?